



FY2015 – Final Report

Specialty Crop Block Grant Program

CONTACT

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<p>Outreach Activities:</p>	<p>Affirmative steps were taken to conduct state outreach to socially disadvantaged farmers and beginning farmers of specialty crops by PDA. This year we have one project, 200 Level Specialty Crop Beginning Farm Workshops that will benefit beginning farmers. Potentials applicants were targeted through the Penn State University county extension offices, state and local associations, and the various USDA offices, to include FSA, NASS, RMA, USDA-RD and PDA economic development programs.</p> <p>The methods used to reach the targeted agricultural community included: press releases (300 PDA outlets, PR newswire service via the Governor’s office) being sent to all above outlets, as well as, ten trade journals targeting producers throughout Pennsylvania, the state Agricultural Newsletter and other community newspapers. Presentation of grant round was included in the PA Fruit & Vegetable newsletter, mailings, and quarterly meeting. We reach out to our five agricultural commodity boards and provide them with the state funding priorities under the Specialty Crop Block Grant Program.</p>
<p>Competitive Process:</p>	<p>PDA publicized a Request for Proposals (RFP) following the suggested ‘best practices’ protocol provided by USDA-AMS. Two steps were involved in the state department’s solicitation for applications. (See appendix- #1 for RFP)</p> <p>PDA received a total of thirty-six (36) specialty crop block grant concept papers; thirty-two (32) were deemed eligible. The total amount of requested dollars from the thirty-two (32) eligible grants was approximately \$2.5 million.</p> <p>The grant applications were reviewed and prepared for presentation to the appointed specialty crop advisory board. The eleven (11) member board is composed of eight (8) men and three (3) women representing a variety of areas within the specialty crop industry. The board consists of individuals with expertise in a wide range of agricultural commodities. The creation of the Specialty Crop Block Grant Board serves to satisfy the USDA-AMS program requirements of transparency, impartial review and oversight. The board represents expertise in production agriculture, distribution, retail, marketing, research, nutrition, and education. Each member represents a level within the specialty crop industry necessary for impacting the availability, consumption and future policy of the industry. The board members were invited based on their professional resumes, and ability to provide impartiality. Board members were required to review and sign and confidentiality/Conflict of Interest Policy Form. This conflict of interest policy was designed to help members of the Pennsylvania Specialty Crop Block Grant Advisory Committee identify situations that present potential conflicts of interest. The Reviewers must consider and declare the possibility of perceived conflicts of interest as well as actual conflicts of interest.</p> <p>The board reviewed the all proposals and scored them based on eligibility and organized into five categories and five commodity groups. The Committee commented and scored proposal’s then provided recommendation for fundability. All projects receiving an average score of above 80 percent was considered worthy of funding.</p> <p>Upon completion of the Specialty Crop Advisory Board Meeting, sixteen (16) applications were</p>

	<p>chosen for funding. The requested amount from the sixteen (16) projects totaled \$940,000. Pennsylvania has been allocated \$992,020.35, due to the lowered allocation many projects were granted awards lower than the requested amount. All projects were reviewed by the advisory committee; the results of the peer review were kept confidential. During the SCBG advisory board meeting members were invited to give feedback, all meeting notes were recorded and kept confidential.</p> <p>Letters and email notification is sent to notify all award recipients and non-recipients after the Secretary for the Pennsylvania Department of Agriculture has signed off on the award amounts. All notification letters were signed by the secretary.</p>
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**Grant
Administration:**

The Pennsylvania Department of Agriculture realizes the important role the Specialty Crop Block Grant program plays within its state and the Northeast, as it currently has the sixteenth largest budget in the country. The department will use \$52,020.35 of the grant funds for direct and indirect costs. These funds will be used for salary/fringe benefits for the grant administrator responsible for all grant contracts, reports to the federal agency, documentation, and grantee performance monitoring. Indirect costs will be at 8%. If grant funds for direct costs do not reach the \$52,020.35 the margin will be used for indirect but will not exceed 8%.

Semi-annual progress reports and financial reports submitted to the Department will be one of the tools that the grant administrator will use to monitor projects within this State Plan. Reports will be used to ensure work is completed within the required timeframe, ensure that specialty crop block grant funds supplement the expenditure of state funds in support of specialty crops grown in the State, rather than replace state funds. If a projects grant period is over a year, a site visit will be performed.

The amount is based on the grant administrator's salary, plus two additional partially funded salaries and fringe benefits (AO1 @ \$39,958.00/six months + AO2 @\$3,952.00/six months + Director @ \$2,693.00/six months) for a total of \$46,603.00 plus indirect costs of \$5,417.35 for a total \$52,020.35. The salary and benefits will begin upon completion of FY2013 grant funding for salary and benefits, which ends September 30th 2016. This funding will be used from October 1st, 2016 through March 30th, 2017.

Category	Amount
Personnel	\$46,603.00
Indirect	\$5,417.35
Total Direct and Indirect Costs for Administration	\$52,020.35

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Summary of Project Budgets:	Project	Name	Direct	Indirect	Award
	1	Planning for Food Safety Modernization Act Implementation	\$88,000.00	\$7,000.00	\$95,000.00
	2	Establishing Sustainable Hops Productions Recommendations for the Pennsylvania Craft Brewing Industry Through the Use of Integrated Pest Management and Varietal Selection	\$138,887.00	\$11,113.00	\$150,000.00
	3	Good Agriculture Practices and Handling Practices Cost Share Program	\$40,500.0	\$4,500.00	\$45,000.00
	4	PA Preferred Culinary Connection with Focus on Promoting Specialty Crops	\$38,096.00	\$1,904.00	\$40,000.00
	5	Up Regulation Mushroom Defense Mechanisms Against Mushroom Files	\$37,037.00	\$2,963.00	\$40,000.00
	6	Tracking Listeria species in a Pennsylvania Packing House and Development of Strategies to Prevent Post-Harvest	\$78,703.00	\$6,297.00	\$85,000.00
	7	Marketing and Accessing more Specialty Crops (Local Food Local Treats)	\$50,000.00	\$0.00	\$50,000.00
	8	Understanding & Minimizing the Ingestion of System Insecticides into the Nectar and Pollen of Commercial Apple	\$41,668.00	\$3,332.00	\$45,000.00
	9	Identify Potato Varieties for Par-Frying Locations across Pennsylvania	\$58,654.00	\$1,346.00	\$60,000.00
	10	Using Roller Crimper Technology, Cover Crops, and Insectary Strips to Improve Organic Vegetable Cropping Competitiveness in Pennsylvania	\$83,333.00	\$6,667.00	\$90,000.00
	11	Improving the Market Share of Non-Traditional Specialty Crops in PA through Farmer Trainings in Production	\$50,000.00	\$0.00	\$50,000.00
	12	200 Level Specialty Crop Beginning Farmer Workshops	\$18,378.00	\$1,622.00	\$20,000.00
	13	Pennsylvania Vegetable Industry Promotion			\$25,000.00
	14	Getting the Word Out about PA Wine Land- Promoting PA Wines and the Agritourism Experience	\$29,000.00	\$1,000.00	\$30,000.00
	15	Enhanced Preparedness Against Major	\$66,665.00	\$5,335.00	\$72,000.00

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	Pathogens that Threaten Crop Production and Markets		
	16 Enhancing Sustainable Practices in the Mushroom Industry		\$43,000.00
	SALARY:	\$52,020.35	\$52,020.35
			\$992,020.35
Project 1	Planning for Food Safety Modernization Act Implementation		
Applicant:	The Pennsylvania Department of Agriculture Bureau of Food Safety and Laboratory Services Dr. Lydia Johnson 2301 North Cameron Street Harrisburg, PA 17110		
Activities Preformed:	<p>Funds were exclusively used to partially support a statewide Extension farm food safety educator. Results are shown for a needs assessment survey of Pennsylvania produce growers and the FSMA produce safety certification courses.</p> <p>FSMA Produce Safety Survey</p> <p>In 2017, Penn State Extension conducted a FSMA Produce Safety needs assessment. A survey was created with the goal of determining to what extent produce growers could be affected by the Produce Safety Rule and how growers would prefer to obtain information and training on FSMA. Surveys were collected from 471 respondents; 112 predominantly Amish growers who attended 2017 farm food safety informational sessions in the Lancaster County area, 250 individuals who filled out an online version of the survey or who completed a paper survey at the Mid-Atlantic Fruit and Vegetable Convention (MAFVC) held in Hershey, PA between January 31 and February 3, 2017, and 109 growers who attended 1 of the first 3 FSMA Produce Safety certification courses offered in 2017.</p> <p>Results for coverage and exemptions status of all respondents, in addition to each sub group, are shown in Table 1. Among all respondents, 71% met the criteria for coverage under the FSMA Produce Safety Rule. Among growers covered under the regulation, 48% would be eligible for a Qualified Exemption. Within the exempt group, 36% would be eligible because over half of their annual food sales are direct to consumers. Only 13% would be eligible because they sold more than half of their food directly to retail or food service operations within the state or within 275 miles of their farm.</p>		

Among covered growers, 63% self-identified within the “very small farm” category and therefore would not be required to comply with the rule until January 2020 while 19% were “small farms” with a compliance date of January 2019 (Table 2). The remaining larger farms who must comply in January of 2018 accounted for 18% of the covered growers. Only 27% of respondents stated they had a good to very good understanding of the FSMA Produce Safety Rule (Table 3) while a majority indicated a poor to fair understanding. Nearly 29% of those who responded indicated that their commercial buyers were mandating compliance with the Produce Safety Rule regardless of actual regulatory status (Table 4). However, most were unsure or indicated they sold only directly to consumers. When asked what their preferred sources of information on FSMA produce safety standards were, a large majority (71%) chose Penn State Extension followed by the Pennsylvania Department of Agriculture (PDA) (41%) (Table 5). Industry trade associations, trade publications, produce auctions, and wholesale buyers ranked lower in preference (23-13%). The most preferred modes to learn about food safety and produce safety rule were the more traditional forms including in-person individual meetings, class room style workshops, the Extension web-site, by mail, and at on-farm workshops (Table 6). Least preferred were e-mail listservs, webinars, and online videos or courses.

Some differences were observed between overall responses and responses from Amish meetings, the general farming public (MAFVC or online), and those attending FSMA produce safety certification workshops. The frequency of responses indicating coverage under the rule were not markedly dissimilar (65-82%), although the public response indicated a generally lower coverage and exemption eligibility frequency (Table 2). This may in part be due to the fact that the grower population in the general farming community includes many who grow non-covered crops such as potatoes, pumpkins, or winter squash.

Grower understanding of the Produce Safety Rule did not differ greatly among the 3 groups (Table 3). FSMA course attendees were nearly twice as likely to report that a commercial buyer had required them to meet the farm food standards within the Rule, regardless of their actual regulatory status (Table 4). This requirement may have been an important factor in their decision to attend the certification class even though they may not yet have reached the compliance deadline.

Regarding preferred sources of obtaining information on the FSMA Produce Safety Rule (Table 5), Amish and FSMA course attendee were far more likely to name Penn State Extension, perhaps in part because the survey was taken at Extension meetings, while the public survey was not as closely linked to a specific Extension event. The Pennsylvania Department of Agriculture (PDA) was the second most preferred source among FSMA course attendees while the public responses were more evenly distributed over the remaining choices. The higher preference among the Amish for produce auctions as information sources was not unexpected given the important role they play in distributing Amish grown produce.

Preferred methods among Amish growers for learning about farm food safety and FSMA produce safety standards was markedly different than the other groups. Their preference for traditional methods such as in-person meetings, classroom workshops, mail, and on-farm workshops over higher technology methods is apparent in Table 6. Public and FSMA course

	<p>attendees were more likely to accept a wider variety of training modes.</p> <p>The results of this survey were used by the Penn State Extension Food Safety and Quality Team to better understand the scope of the audience, challenges they face in meeting new FSMA requirements, and best approaches for marketing upcoming courses and workshops.</p> <p>FSMA produce safety certification training</p> <p>In the fall of 2016, the Produce Safety Alliance (PSA) released the finalized produce safety curriculum. Intent to present a course requires that a PSA approved Lead Trainer (LT) formally submit a request for approval to the Association of Food and Drug Officials (AFDO). PSA curricular materials are then sent to the LT applicant. The LT recruits approved Trainers to assist with delivery of the workshop. The location, number of registrants, and location of 7 PSA courses presented by Penn State Extension in 2017 is shown in Table 7. A total of 246 growers were trained and received the AFDO certificate. The Allentown workshop was co-sponsored by Wegmans Foods and the Kennett Square workshops were co-sponsored by the American Mushroom Institute. The Pennsylvania Department of Agriculture (PDA) provided funds, from another grant, for purchase and shipping of the PSA Grower Training Manual and AFDO registration fees (total ~ \$100 per farm).</p> <p>A standard form created by the PSA and required to submit to PSA was used for evaluations. The following questions were extracted from the evaluation 1) Was the instructor organized, 2) Was the Instructor familiar with the course, 3) Was the instructor able to answer questions, and 4) Was the Information in the course sufficient to start implementing the requirements in the regulation. In summary of the data in Table 8, ratings for instructors at each of the 7 locations and for each question were overwhelmingly positive, ranging between 89 to 100% of respondents answering affirmatively. Scores measuring readiness to start implementing FSMA requirements ranged from 65 to 97%. Some comments indicated frustration with uncertainties in how the regulations will be implemented, particularly the ag water material which may be reflected in the slightly lower scores for readiness to start FSMA implementation.</p> <p>Because the entire funds from this grant are used in partial support of a state wide farm food safety Extension Educator with specialized experience and skills in teaching members of the plain community (Mr. Jeff Stoltzfus) in Lancaster, PA, Table 9 is presented showing each of the events in which he was the lead educator and the number of total and plain registrants. In summary, he made presentations or presented workshops on 29 occasions to 1216 individuals of which 772 (63%) were Amish or Mennonite.</p>
Problems and Delays:	<p>There were delays in the release of the Produce Safety Alliance FDA approved curriculum for FSMA grower certification courses. However once the Grower Manual and slide set were released in the fall of 2016, we were able to quickly set up a schedule of courses starting in January 2017. Although our evaluations were very good, scores were somewhat lower for the category rating sufficiency of the course for getting growers to start implementing requirements in the Produce Safety Rule. This is likely due to the imprecise language in the rule and rumors that some of the original requirements, most notably for agricultural water, were under review by FDA.</p>
Future Project Plans:	<p>We will continue to provide FSMA certification training to Pennsylvania produce growers in 2017-2018. Eleven courses have been scheduled for throughout the state. The list of courses</p>

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	can be found at https://extension.psu.edu/fsma-grower-training			
Funding Expended to Date:	To date, \$46,916.27 has been expended. The project has not gained any income as a result of activities conducted.			
Project 2	Establishing Sustainable Hops Productions Recommendations for the Pennsylvania Craft Brewing Industry Through the Use of Integrated Pest Management and Varietal Selection			
Applicant:	Penn State Extension, Schuylkill and Berks Counties Tanner Delvalle 1202 Ag Center Drive Pottsville, PA 17901			
Activities Preformed:	In 2016, a one acre hopyard was constructed from May through July at the Russell E. Larson Agricultural Research Center at Rock Springs in Pennsylvania Furnace, PA. The processes to achieve the goals outlined by the grant are as follows:			
	Project Activity	Planned Date of Completion	Actual Date of Completion	Notes and contributors
	Survey the PA brewing industry to determine use of locally grown hops	October – November 2015	January 2016	Delvalle, Butzler, Ford
	Construct and establish a 1 acre hopyard with commercially available varieties	October - March 2016	July 2016	Delvalle, Butzler, Ford, Gugino, Sanchez, Elias
	Implement trickle irrigation, weed barriers, and mulching systems for quality hops production	March -May 2016	July 2016	Delvalle, Butzler, Ford, Gugino, Sanchez, Elias
	Utilize integrated pest and disease management techniques	March -September 2016	2016-2017 & Ongoing into 2018	Delvalle, Butzler, Ford, Gugino, Sanchez, Elias
	Collect and analyze yield data	August - September 2016	September 2017 & Ongoing into 2018	Plant vigor ratings Delvalle, Butzler, Ford, Sanchez

Analyze hops quality and stability data	September 2016	October 2017	Harvest Completed in 2017
Develop enterprise budget		Ongoing	Estimated after harvest in 2017
Conduct extension outreach activities with growers and homeowners. Collect impact data on increases in knowledge and skills	September – March 2016	2016-2017 & Ongoing	Dozens of discussions with current and prospective growers. Hops 101 meeting held in February of 2016 with 90 growers and prospective growers, and 2017 with 80 attendees. Delvalle, Butzler, Ford, Gugino, Sanchez, Elias
Write and disseminate articles/fact sheets	September 2016	In development	Delvalle, Butzler, Ford
Travel to establish and maintain hopyard	March – October 2016	Ongoing	Delvalle, Butzler, Ford, Gugino, Sanchez, Elias
Annual and final project reports respectively	September 2016	2016 and 2017 Annual Reports completed, Final report in 2018	Delvalle

In January of 2016, a survey of the Pennsylvania Craft Brewing Industry was completed. Surveys were sent to approximately 139 craft breweries. 34 surveys were returned, which equates to a 25% return rate. The following are some outcomes from the surveys:

1. The average craft brewery in Pennsylvania brews approximately 4,028 barrels of beer annually.
2. The five most commonly used hop varieties are:
 - a. Cascade
 - b. Centennial
 - c. Chinook
 - d. Nugget
 - e. Citra
3. Of just the breweries which responded:
 - a. 219,616 pounds of aroma hops were used in 2015.

- b. 30,237 pounds of bittering hops were used in 2015.
4. 94% of breweries (31) preferred to use dry pelletized hops.
5. 66% of breweries (22) are under contract to purchase hops.
6. 100% (33) of breweries indicated they would consider purchasing Pennsylvania grown hops if the quality and varieties were to their specifications.
7. 30% of craft breweries (10) currently buy Pennsylvania grown hops.
8. The number one constraint to sourcing hops is the availability of preferred varieties.

The results of the survey demonstrate the need for both research and continued growth in the hops industry. It is apparent that craft breweries want to utilize locally grown hops, if they are available. There is simply not enough hops production in Pennsylvania. If an average harvest of approximately 1,000 pounds of dry hops is harvested per acre, there would need to be at least 250 acres of hops in production just to meet the needs of the breweries that returned the survey. Given the fact that only 25% returned the survey, and the fact that there is a wide range in the size of each brewery, it is safe to assume that at least 1,000 acres of hops would need to be in production to meet the needs of the craft brewing industry in Pennsylvania. Currently, it is estimated that there is less than 50 acres of hops in production in Pennsylvania. Finally, four of the top five varieties used are featured in the project, with the exception of Citra, which is a proprietary variety that cannot be obtained for research.

The construction of the research hopyard has been met entirely. The steps of the completed tasks are shown below.

1. Site selection and soil testing of the site
2. Plot layout, using randomized complete block design
3. Ordered materials for the hopyard
4. Ordered plants for the hopyard
 - a. Spalter Select
 - b. Willamette
 - c. Chinook
 - d. Columbus
 - e. Centennial
 - f. Newport
 - g. Mt. Hood
 - h. Nugget
 - i. Crystal
 - j. Teamaker
 - k. Brewers Gold
 - l. Cascade
5. Tillage, lime application, and black plastic laying for weed control
6. Received hopyard poles and prepared them for use
7. Auger holes for poles to be placed into soil (100)
8. Placed and set poles (100)
9. Placed plants into black plastic throughout hopyard

10. Installed drip irrigation in hopyard
11. Performed weed control
12. Seeded row middles with turf-type tall fescue seed

The following procedures were completed in the winter of 2016 through the spring and summer of 2017:

1. Installed Trellising hardware and aerial support wires
2. Assembled and repaired irrigation lines
3. Planted 3 new varieties of hops into open plots (Sterling, Alpha, and Tahoma)
4. Installed coconut coir to support growing bines
5. Provided fertilization to plants
6. Performed integrated pest management techniques
7. Harvested all hop plants and recorded yield information
8. Performed lab analysis of hop cones
9. Cleaned hopyard in preparation for winter of 2017-2018
10. Construction of oast for drying hops was initiated in the fall of 2017

The expected measurable outcomes laid out for the project are shown below. The progress toward each part of the plan is shown as well.

Goal: *Increase the number tools available to current and prospective hops growers on proper selection of hops varieties and the respective integrated pest management techniques to produce quality hops in PA.*

Performance Measures:

- *Establish a replicated hops research and demonstration trial, collect data, analyze, and generate results from field and laboratory trials.*
The construction of the trial has been completed. Data on yield and cone analysis was collected. Data will be compared with 2018 harvests and analyzed for comparison. Recommendations will be developed at this time for prospective and current growers.
- *Develop research-based recommendations for hops growers based on results from field and laboratory trials.*
The laboratory analysis guidelines and protocol have been set by Dr. Elias, and have been performed from 2017 harvests. These results will be compared with 2018 harvests, from which future recommendations can be made.
- *Develop fact sheets for growing quality hops in PA which will include a section on hops production in production guides, a sample budget, and web-based information on hops production.*
Fact sheets will be created after the harvest in 2018. A sample budget is in the process of being created, using cost figures from the construction of the research hopyard. An average of two years (2017 and 2018) hopyard costs will be used to develop an accurate representation of expected costs for new growers.

Benchmark:

- *Research has not been conducted in PA on hops production; therefore, results of the proposed project will represent an increase in the knowledge available to current and prospective hops producers.*

Since performing the first harvest, progress and recommendations for hop producers has been disseminated through social media, grower visits, and phone calls. The work on the research hopyard achieved up to this point is the basis for most of the discussions with current and prospective hop producers. A meeting for growers in at the research hopyard will be held in the summer of 2018. Our findings and recommendations will be showcased at this time.

Target:

- *Recommendations will be developed for selecting proper hops varieties to grow in PA. Recommendations on varieties are currently available through this research, but will be compared to harvest in 2018 to develop replicated guidelines.*
- *Recommendations will be developed on the proper integrated insect, disease, and weed management techniques for hops production. Currently, we have developed guidelines on proper pest management strategies. This information is being developed into fact sheets, which will be available in 2018.*
- *Development and distribution of fact sheets on hops production. Fact sheets are in the process of being created, but will be completed after data is collected in 2018.*
- *Increased availability of PA grown hops to local brewers.*

More hops are being grown in Pennsylvania each year. The results of this project will allow prospective growers to make better choices and understand pest management in hopyards. Because of this project, contact and recommendations have been made to more than 250 growers or prospective growers in Pennsylvania through 2017.

Performance Monitoring Plan:

Data collected related to the proposed objectives of this project (varietal selection, disease severity, insect damage, marketable yield, cone oil and acid content, etc.) in the first year will be analyzed and necessary adjustments will be made prior to beginning analysis of trial in year two.

The first harvest was performed in 2017. A second harvest will be performed in 2018. Data from the 2017 harvest are shown below.

The image below shows the current plot plan for this trial.

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EAST												WEST																			
Existing Drive Row (8 ft from row middle)																															
Border Crop		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade											
14 ft between rows		7 plants per sub-plot (42" spacing)																													
REP 1		Spalter Select		101		Spalter Select		Willamette		201		Willamette		Chinook		301		Chinook		Sterling		401		Sterling		Columbus		501		Columbus	
		Tahoma		1001		Tahoma		Centennial		901		Centennial		Newport		801		Newport		Mt. Hood		701		Mt. Hood		Nugget		601		Nugget	
		Crystal		1101		Crystal		Teamaker		1201		Teamaker		Alpha		1301		Alpha		Brewers Gold		1401		Brewers Gold		Cascade		1501		Cascade	
REP 2		Brewers Gold		1402		Brewers Gold		Tahoma		702		Tahoma		Willamette		202		Willamette		Centennial		902		Centennial		Mt. Hood		702		Mt. Hood	
		Chinook		302		Chinook		Nugget		602		Nugget		Teamaker		1202		Teamaker		Crystal		1102		Crystal		Alpha		Alpha			
		Sterling		1502		Sterling		Spalter Select		102		Spalter Select		Columbus		502		Columbus		Cascade		1502		Cascade		Newport		802		Newport	
REP 3		Centennial		903		Centennial		Alpha		Alpha		Nugget		603		Nugget		Willamette		203		Willamette		Crystal		1103		Crystal			
		Columbus		503		Columbus		Brewers Gold		1403		Brewers Gold		Mt. Hood		703		Mt. Hood		Spalter Select		103		Spalter Select		Tahoma		Tahoma			
		Newport		803		Newport		Chinook		303		Chinook		Cascade		1503		Cascade		Sterling		Sterling		Teamaker		1203		Teamaker			
REP 4		Mt. Hood		704		Mt. Hood		Sterling		Sterling		Crystal		1104		Crystal		Columbus		504		Columbus		Brewers Gold		1404		Brewers Gold			
		Alpha		Alpha		Newport		804		Newport		Spalter Select		104		Spalter Select		Nugget		604		Nugget		Willamette		204		Willamette			
		Cascade		1504		Cascade		Tahoma		Tahoma		Centennial		904		Centennial		Teamaker		1204		Teamaker		Chinook		304		Chinook			
Border Crop		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade		Cascade			

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Analysis	Cascade	Chinook	Nugget	Alpha	Brewers Gold	Columbus	Crystal	Mt Hood	Newport	Spalter Select	Tahoma	Tea Maker
% Moisture	8.38	4.55	7.10	7.50	8.90	15.60	10.50	8.00	15.00	13.20	7.00	4.10
Total Alpha acid (%)	0.98	2.85	1.91	1.24	1.22	2.86	1.98	2.09	2.57	0.79	1.03	0.66
Total Beta Acid (%)	1.27	1.28	1.65	1.77	1.06	1.88	2.82	2.20	1.86	1.42	1.21	2.83
HSI	0.41	0.35	0.44	0.46	0.33	0.31	0.30	0.22	0.23	0.47	0.40	0.24
Acid (%)												
α-acid cohumulone	1.64	3.76	2.94	1.57	1.00	3.03	2.05	1.22	2.88	1.57	0.98	0.55
α-acid n- + ad-humulone	3.94	7.90	10.55	4.81	1.97	5.32	6.01	3.63	5.94	2.76	4.12	0.98
β-acid colupulone	1.94	2.20	2.51	1.88	1.05	2.61	2.42	2.21	3.47	2.66	2.09	4.00
β-acid n- +ad-lupulone	2.00	1.62	2.75	1.92	0.65	1.46	3.66	2.83	2.34	1.71	2.27	4.12
Total alpha acids	5.59	11.65	13.49	6.37	2.97	8.36	8.06	4.85	8.82	4.32	5.10	1.52
Total beta acids	3.95	3.82	5.26	3.81	1.70	4.07	6.08	5.05	5.81	4.37	4.36	8.12
Total essential acid (ml/100g)	0.32	0.55	0.25		0.25				1.50			0.90
Component (g/ml)												
Myrcene	0.39	0.31	0.34		0.34				0.37			0.39
Caryophyllene	0.10	0.13	0.14		0.10				0.08			0.06
Farnesene	0.10	0.00	0.00		0.00				0.00			0.00
Humulene	0.19	0.19	0.22		0.14				0.16			0.00

Dissemination of Project Results:

PI Delvalle and co-PIs Ford and Butzler are commercial horticulture educators and will disseminate the results of the proposed research during seasonal meetings, field days, and in print and web-based materials. Results will also be presented at the Mid- Atlantic Fruit and Vegetable Convention, the Pennsylvania Farm Show, and Penn State Ag Progress Days.

In 2016, a Hops 101 meeting was held in conjunction with the Mid-Atlantic Fruit and Vegetable Convention. The meeting was very well received, and had no open seats available with 90 total attendees. The goals of this project were outlined to the audience, which showed their enthusiasm for the project through evaluations. A similar, but more advanced meeting was held on January 31st, 2017 at the Mid-Atlantic Fruit and Vegetable Convention. This meeting had 80 attendees. The progress of this project was shown by PI Delvalle. On July 12th, 2017, a Vegetable Growers Field Day was held at the Russel E. Larson Agricultural Research Center at Rock Springs, where this trial was showcased to more than 50 growers. Future progress and results of the project will be shown at the 2018 Ag Progress Days, where a formal tour and program will take place. Guidelines for home-growers of hops will be developed after the second harvest, and this information will be shared with the public through Penn State Master Gardeners.

Problems and Delays:

In 2016, there were a few instances that caused the project to be delayed several months. The foremost issue was in regards to the 2015 Pennsylvania State Budget. Given the nature of the historical budget impasse, purchases for grants were not able to be made until after the state budget was passed, as there was uncertainty about the future of extension. This moved the construction of the hopyard several months into the late spring, which was not anticipated. Between the time needed to make purchases, having them approved, and then taking shipment took several weeks. Ground was not broken on the hopyard until late May of 2016. Poles needed to be stripped of bark, as well as coated with a material to withstand ground moisture. This process was not complete until early June, which is when the holes began to be dug to house the 22 foot-long hopyard poles. Digging 100 holes at the research farm proved to be a challenge, and took more than a month to accomplish. The prevalence of limestone outcroppings throughout the field was an unforeseen issue, which created the need for heavy

	<p>machinery to be used as a slow pace. Jackhammers, rock augers, and hydraulic rock breakers were used to get through the rock and allow for a depth of four feet to be reached, which is the standard depth for hop poles to be placed into the ground. Once the holes were completed, the poles were placed into the holes immediately in July. Plants were then planted in one day, with the help of several volunteers. After planting, drip irrigation was installed. By this point, a large portion of the growing season had already passed, which is necessary for proper plant development. It was decided to allow the newly planted hop plants to grow vegetatively, to allow the root systems to become established, which can be a challenge of its own in the middle of summer. Trellising the plants would have caused undue stress to the new plants, so this process did not occur until the winter of 2016/17. Through careful plant maintenance in the remainder of 2016, only one plant out of 812 needed to be replaced.</p> <p>In 2017, the trellis infrastructure was completed. Soon after however, downy mildew was evident in most of the plants throughout the yard. This disease set back the entire planting several weeks, which eventually impacted harvest in August of 2017. Though controls are available for downy mildew, the timing of this infection was extremely early, and after discussion and analysis, it was deemed that the infection had actually come in on the plants when they were purchased. In the future, controls will be applied at emergence, to prevent this issue from occurring again. Overall, the 2017 harvest was not as much as desired, but a large harvest is not typical until the third year of a planting. This, coupled with control strategies, should yield great results in 2018.</p> <p>his project was granted a one-year no cost extension, which will allow ample time to get two years of harvest data to draw conclusions on establishing guidelines for growing hops in Pennsylvania, as well as management information through integrated pest management.</p>
Future Project Plans:	<p>Over the next year, several parts of the plan will be accomplished. These are as follows:</p> <ol style="list-style-type: none"> 1. Complete construction of oast, for rapid drying of large quantities of hops – Spring 2018 2. Install the coconut coir for the hop plants to grow upon – Spring 2018 3. Perform pest management in hopyard – Spring, Summer, and Fall 2018 4. Collect and analyze yield data – Fall 2018 5. Analyze hops quality and stability data – Immediately after harvest in Fall 2018 6. Develop enterprise budget – Spring 2018, and amend in Fall/Winter 2018 with yield information 7. Conduct outreach – Currently through remainder of project timeline 8. Write and disseminate articles and factsheets – Spring through Fall 2018 9. Travel to maintain hopyard - Currently through remainder of project timeline 10. Final Report – Fall 2018
Funding Expended to Date:	\$124,715.41

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Project 3	Good Agriculture Practices and Handling Practices Cost Share Program
Applicant:	The Pennsylvania Department of Agriculture Bureau of Market Development Kyle Heffner 2301 North Cameron Street Harrisburg, PA 17110
Project Summary:	Provide cost sharing support for successfully completed USDA Good Agricultural Practices (GAP) or USDA Good Handling Practices (GHP) audit annually. The program provides a maximum reimbursement of \$400 towards one successfully completed audit per year. The reimbursement is used as an inducement for farmers who are considering participation in the voluntary audit process. Given the increasing requirements of retailers, these audits are a way for our producers to be more competitive when marketing their product.
Project Approach:	<p>The program is administered by the Pennsylvania Department of Agriculture through applications made available on its website (PDA GAP/GHP Cost Share Program) and through paper applications made available upon request, by auditors and at various trade shows. This is not the first time this project has received grant funding. At the time the first grant was written, less than 20 producers in Pennsylvania were participating in the voluntary GAP/GHP audit program. In the first 12-24-B-0946 grant, there were 40 participants in the first year of the program and 81 participants in year two. An advisory group, which included stakeholders from fruit, vegetable and mushroom growers associations assembled to address the cost share program recommended to set the cost share amount at a maximum of \$400 to maintain a good return for producers and ensure funds would be available for the maximum amount participants.</p> <p>This grant (15SCBGPPA0055) provided cost share funds to 106 applicants for a total of \$42,193.00 over two applications periods. Funding from a new grant was utilized in 2017 to cover all remaining applicants.</p>
Goals and Outcome Achieved:	At the outset of the grant, a total of \$45,000 was budgeted in anticipation of 78 applications being funded in 2016 and 2017. The calculations for anticipated numbers of applications were based on historic data and experience with similar cost share programs. This was a lower number than in previous years based primarily on overlapping grant funds from previous and current years. Because of the demand and in order to make the best use of funds overall for the Specialty Crops Block Grant program, this applicant provided 106 applicants with reimbursement for their cost share application.
Beneficiaries:	This grant provided cost share funding to 106 applicants for a total of \$42,193.00. The operations were all specialty crops operations either participating in the Good Agricultural Practices, Mushroom Good Agricultural Practices or Good Handling Practices USDA audits.
Lessons	While the overall rate of growth in participation in the program as it relates overall to GAP/GHP

Learned:	<p>cost share activity appears to be reaching a plateau, there are lessons learned and possible new approaches that can increase participation in the program in the future.</p> <p>First, it may be prudent to begin the discussion of allowing GAP/GHP cost share funds to also provide reimbursement for these third-party audits as the producer or handler is often put in the position of needing these audits based solely on retailer expectations. The increased influence of retailers in determining the acceptable audit standards (anecdotally) appears to be moving producers to third-part auditors. The program under this activity only provides funding for USDA approved audits.</p> <p>Second, continued and increased outreach is essential to increasing participation in this program and our field staff is our first line of information because they are out on the operations. Providing increased training in the program to field staff will allow us to reach producers on an individual basis. This has become more imperative due to the introduction of Group GAP/GHP Audits.</p> <p>Lastly, the use of web and print publications as well as targeted mailings can all be used to greater effect in the future.</p>
Project 4	PA Preferred Culinary Connection with Focus on Promoting Specialty Crops
Applicant:	<p>Strategic Contracting Maria Hulitt 9159 Green Tree Road Philadelphia, PA 19118</p>
Project Summary:	<p>The PA Preferred Culinary Connection ranks among the most visited attractions of the Pennsylvania Farm Show. Over the course of eight days, the PA Preferred Culinary Connection hosts nearly 70 cooking demonstrations and competitions, with a focus on providing nutrition knowledge and showcasing the importance in consumption of Pennsylvania- sourced products and particularly specialty crops. Chefs from throughout Pennsylvania, TV Celebrity Chefs, and Culinary Schools educate the audience on the advantages of consuming specialty crops by incorporating such products into their recipes. Representatives from organizations such as the Pennsylvania Vegetable Growers, PA Apple Growers, PA Mushroom Institute, PA Co-Operative Potato Growers, PA Winery Association, PA Beekeepers Organization and PA Maple Syrup Producers directly participate in the stage demonstrations and hand out product samples and literature on local producers and the advantages of buying from Pennsylvania sources. Certain days are designated by a specific specialty crop, which becomes the main ingredient to be incorporated in all dishes prepared on our stage that day (For example, Mushroom Day, Vegetable Day, Apple Day, Potato Day etc.) Samples of each dish are prepared for audience members to taste in the conclusion of each demonstration. In addition, the PA Preferred Culinary Connection focuses on educating children and adults on healthy eating habits and food safety by demonstrating step-by-step food preparation while utilizing locally grown specialty crops.</p>

	<p>The importance of this project constitutes in the idea that it allows local farmers and food suppliers to showcase their specialty crops to local consumers; to educate the patrons on the health benefit to their families as well as the impact on their community's local economy by highlighting the quality and accessibility of those products; to reach out to the restaurant community and encourage Chefs to use Pennsylvania-sourced fruits, vegetables and herbs in their establishments; and to increase the overall demand for locally grown, sustainably produced specialty crops. By creating spectacular dishes on stage using local specialty crops, our demonstrating Chefs have educated consumers that they can prepare delicious meals at home by utilizing solely Pennsylvania fruits, vegetables and herbs.</p> <p>Specialty Crops commodity groups face the need to constantly find new ways to market their products and increase sales of those specialty crops products. The project fulfills those needs by allowing Specialty Crops commodity representatives from the Pennsylvania Vegetable Growers, PA Apple Growers, PA Mushroom Institute, PA Winery Association, PA Beekeepers Organization and PA Maple Syrup Producers to directly participate in the stage demonstrations and hand out product samples and literature to the patrons. Their products are offered for purchase in close proximity to the PA Preferred Culinary Connection stage in the Main Expo Hall. Those specialty crop stakeholders directly benefit from this project as the PA Preferred Culinary Connection delivers immediate benefits to the specialty crops organizations and the local economy in the form of increased sales and marketability of PA commercially-grown specialty crops as it allows local farmers and food suppliers to showcase their specialty crops to local consumers.</p>
Project Approach:	<p>The organization and management of the PA Preferred Culinary Connection with focus on promoting Pennsylvania Specialty Crops have largely followed the proven model while incorporating some additional elements, which we believe have further benefited the Pennsylvania Department of Agriculture in its effort to enhance the competitiveness of Pennsylvania's specialty crops. Our efforts have focused on fulfilling the purpose of the PA Preferred Culinary Connection with focus on promoting Pennsylvania Specialty Crops – to showcase and promote the use of Pennsylvania-sourced products and particularly specialty crops in preparing original dishes, increase consumer awareness of those locally grown products and highlight the quality and accessibility of specialty crops - while incorporating entertainment, flair and star talent in delivering this message.</p> <p>The First Annual PA Preferred Culinary Connection VIP Reception was a huge success. Sponsors, media and special guests had the exclusive opportunity to get a sneak peek at the 2016 PA Preferred Culinary Connection and the 100th Farm Show. Chef Instructors and Students from the Culinary Arts program at the Pennsylvania College of Technology prepared hors d'oeuvres using the recipes included as part of the 2016 Recipe Book and to be demonstrated throughout the week. Guests enjoyed signature dishes before the crowds, paired with local PA Wines, received a souvenir 100th Farm Show wine glass and a copy of the 2016 Recipe Book. In attendance were the Governor of Pennsylvania, Tom Wolf and the Secretary of Agriculture, Russell Redding.</p> <p>Following her live appearance on abc27 morning news, Gina Neely – star of the hit Food Network show “Down Home with the Neelys” - kicked off the 2016 PA Preferred Culinary</p>

Connection on Saturday, January 9th. She demonstrated two signature mushroom dishes and encouraged the audience to look for the PA Preferred logo and buy local specialty crops. A two-time semi-finalist for the prestigious James Beard Foundation award for best chef Southeast, Craig Deihl of Cypress not only delivered an engaging and highly intricate culinary presentation, but spent close to 10 hours in the back kitchen working along the Culinary Students from the Pennsylvania College of Technology, showed them special techniques and shared stories from his years in the field. Jerry Gates and Charlie Hornbaker's love for BBQ led them to sign up and compete in the 2015 Blue Ribbon Better Blend Burger, which was sponsored by the PA Preferred program, the American Mushroom Institute and Hoss's Steak and Sea House. The Bar-B-Que Mayham Competition Team won 1st place and the chance to present their Bar-B-Que Mayham Mushroom and Swiss Burger on the PA Preferred Culinary Connection stage. Three of the most prominent farm-to-table restaurants in Pennsylvania were also featured on Saturday, when Chef Mandi Horn of Horn O' Plenty, Chef Lance Smith of The Millworks and Chef Bill Collier of BRICCO took the stage to celebrate Mushroom Day. Their creations - Mushroom Leek Gratin, Local Roasted Mushroom Tacos and Mushroom Bisque - included all locally grown ingredients and everyone in the audience got the opportunity to taste them.

This year's Thermador Chefs Challenge attracted hundreds of spectators. Chef Anthony Marino of Don's Appliances in Pittsburgh and the morning news team from WHP CBS 21 defeated Chef Mandi Horn and the media team from WHTM abc27 in a heated culinary battle. Judges included representatives from Thermador, the PA Winery Association and Weis Markets. The Phillie Phanatic rocked the stage once again and had the audience dancing and cheering for their favorite team. Both teams were given 30 minutes to make a dish using a blind bin of ingredients and a common pantry of food items. Although Chef Anthony and his "Sous Chefs" from CBS 21 won the blue ribbon, both teams, as well as the audience, enjoyed the abundance of local flavors, energy and excitement that this highly popular event gets to offer each year. Sunday was Vegetable Day and all Chefs focused on promoting local specialty crops by demonstrating recipes comprised almost entirely of Pennsylvania vegetables. From Wes Trout's Cauliflower and Chickpea Salad to Brian Little's Root Vegetable Terrine, all recipes received a huge round of applause from the audience and got to be featured in the complimentary 2016 PA Preferred Recipe Book. Keystone members of the Pennsylvania Vegetable Growers Association, James & Dorothy Oswald - Founders and Co-Directors of the Institute for Plant Based Nutrition - joined us on stage to offer vegan education and share the benefits of plant-based nutrition. The PA Preferred Culinary Connection stage was featured live on the Pennsylvania Cable Network (PCN) all day Monday, Weis Day. PCN covered all cooking demonstrations on their network and thousands of viewers, in addition to the hundreds in attendance, got the chance to see our talented Chefs in action. Beth Stark and Kathryn Long, Healthy Living Coordinators at Weis Markets demonstrated how to prepare a Pumpkin Chicken Chili and discussed the nutritious value of consuming fresh, local foods. David Taddei, Executive Chef at DelGrosso's returned to our stage for the 100th Farm Show with a signature dish: Penne Alfredo with Sweet Sausage & Roasted PA Vegetables. Six-time Emmy Award Winning Chef for a Taste of History, Walter Staib, once again attracted a huge audience, as well as an ample media attention. Close to 400 spectators lined up on Weis Day to get a taste of his Beer Risotto with Bratwurst. Mark Spedale, creator of Primizie Snacks and David Santucci of Country Fresh Mushrooms in

	<p>Avondale, PA joined us for a first time and prepared dishes with fresh, local specialty crop ingredients. First Lady of Pennsylvania Frances Wolf and Chef Barry Crumlich prepared Hand-crafted Butternut Squash Pierogis with Sage Butter Sauce and Honey Roasted Shaved Brussels Sprouts. All dishes prepared on stage were paired with local Pennsylvania wines, courtesy of the Pennsylvania Winery Association.</p> <p>We offered a plate full of excitement and local flavors to everyone who came to visit the PA Preferred Culinary Connection on the last day of the 100th Farm Show. John Moeller, former White House Chef and Author of "Dining at the White House—From the President's Table to Yours, Josh Short, Executive Chef at Harvest Seasonal Grill & Wine Bar, and Mario Stanzione, from the Hollywood Casino at Penn National Race Course demonstrated delicious, dairy and specialty crops - inspired dishes, all paired with wines from local vineyards. Department of Agriculture officials, Penn State University faculty and students, and Pennsylvania Dairy royalty went scoop-to-scoop in a Berkey Creamery Scoop-Off. The audience had the opportunity to sample the new "Birthday Bash" ice cream flavor and learn about the creamery's history.</p>
Goals and Outcomes Achieved:	<p>The goal of this project is to encourage Pennsylvania citizens to select fresh, locally grown specialty crops when they shop and dine, by involving specialty crops organizations to directly market their products to the consumer, as well as utilize Chefs and TV Personalities in expanding the awareness and use of specialty crops, by which building a positive behavior for eating more nutritious food. The purpose of this project is to increase the sales of locally grown specialty crops through improving consumer awareness of specialty crop preparation. This increase in sales is documented through the daily sales records of the Pennsylvania specialty crop organizations that sell products in the Main Expo Hall. According to the Pennsylvania Department of Agriculture, in 2016: Pennsylvania Maple Syrup Producers sold more than 6,500 bags of maple cotton candy, 500 gallons of maple syrup and 250 gallons of Mapleade; The Pennsylvania State Horticulture Association sold more than 6000 apple dumplings, 7,500 quarts of apple cider, and 25 bushels of apples; Pennsylvania Mushroom Grower's Cooperative sold more than 12,400 pounds of mushrooms; Pennsylvania Vegetable Growers sold 7,000 servings of batter-dipped vegetables, 6,000 blooming onions, 3,000 funnel cakes, 5,255 bowls of soup, 1,600 bowls of salad, 1,500 pickles, 850 pieces of pie, 700 vegetable wraps, 7,300 strawberry surprises and 2,475 raspberry lemonades; Pennsylvania Dairymen's Association used more than 19,000 gallons of milkshake mix, 75 pounds of American cheese and 260 loaves of bread for grilled cheese sandwiches, 450 gallons of ice cream and 4.1 tons of mozzarella cheese. Pennsylvania Beekeepers Association sold more than 1,400 gallons of honey ice cream and used more than 700 pounds of waffle mix. Our goal is to continue helping those organizations by increasing the sales of those locally grown specialty crops through improving consumer awareness of specialty crop preparation.</p> <p>The project's importance consists in the fact that the PA Preferred Culinary Connection delivers immediate benefits to the specialty crops organizations in the form of increased sales and marketability of PA commercially-grown specialty crops; allows for increased access, availability, and consumption of PA-grown specialty crops; results in increased child and adult knowledge of the nutritional benefits of specialty crops as well as access to and consumption of specialty crops. The purpose of this project is to allow local farmers and food suppliers to showcase their</p>

specialty crops to local consumers; to educate the patrons on the health benefit to their families as well as the impact on their community's local economy by highlighting the quality and accessibility of those products; to reach out to the restaurant community and encourage Chefs to use Pennsylvania-sourced fruits, vegetables and herbs in their establishments; and to increase the overall demand for locally grown, sustainably produced specialty crops. Our plan for the 2017 recipe book is to once again put the spot light on specialty crops, by having our Chefs make those ingredients the focal point of the dishes to be demonstrated on the PA Preferred Culinary Connection stage. Such initiative directs our audience's attention to the variety and flavor of local fruits and vegetables and encourages them to select those products when they shop and dine. That in turn directly benefits Pennsylvania farmers and local specialty crops organizations by increasing the demand for their products. Our efforts will once again focus on fulfilling the purpose of the PA Preferred Culinary Connection – to showcase and promote the use of Pennsylvania-sourced products and particularly specialty crops in preparing original dishes, increase consumer awareness of those locally grown products and highlight the quality and accessibility of specialty crops - while incorporating entertainment, flair and celebrity talent in delivering this message. According to the PA Department of Agriculture, 93% of Pennsylvanians want to purchase locally produced items.

The 2016 PA Preferred Culinary Connection received ample media coverage, including write-ups as part of: The Patriot-News, central Pennsylvania's award-winning top daily local news source, which, along with PennLive reaches nearly 500,000 readers weekly, the Pittsburgh Post-Gazette, Berks County Living Magazine, Fig Lancaster, Northcentral PA, The Morning Call, Times Leader, philly.com, The Daily Item, The Town Dish, Lancaster Online, The Citizen Standard, The Express-Times, American Agriculturist, The Record Herald, Flipside PA, among others. WHP CBS 21, abc27 WHTM, Fox 43 and Blue Ridge Cable 11 aired footage directly from the stage, conducted interviews and put the PA Preferred Culinary Connection in the spotlight, spreading the word of the importance of buying local to thousands of viewers and listeners. The Pennsylvania Cable Network (PCN), a statewide network with bureaus in Philadelphia and Pittsburgh, delivered close to eight hours of live coverage directly from the PA Preferred Culinary Connection Stage.

Representatives from organizations such as the Pennsylvania Vegetable Growers, PA Apple Growers, PA Mushroom Institute, PA Potato Growers, PA Winery Association, PA Beekeepers Organization and PA Maple Syrup Producers directly participate in the stage demonstrations and hand out product samples and literature to the patrons. Their products are offered for purchase in close proximity to the PA Preferred Culinary Connection stage in the Main Expo Hall. Of the 7 specialty crops organizations directly participating in the stage demonstrations and handing out product samples and literature to the patrons, almost all showed increased sales of specialty crops product by more than 5% from 2016 to 2017.

According to official data collected by the Pennsylvania Department of Agriculture, in 2017:

- sales of maple syrup increased from 500 to 600 gallons (20% increase)
- sales of apple dumplings increased from 6000 to 10000 (66.67%)

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	<ul style="list-style-type: none"> • sales of apple cider increased from 7500 quarts to 12000 quarts (60%) • sales of apples increased from 25 to 75 bushels (200%) • sales of batter-dipped vegetables increased from 7000 to 7200 servings (2.86%) • sales of vegetable wraps increased from 700 to 784 (12%) • sales of raspberry lemonades increased from 2475 to 2800 (13.13%) • sales of honey ice cream increased from 1400 gallons to 1500 gallons (7.14%) • sales of waffle mix increased from 700 pounds to 1000 pounds (42.86%)
Beneficiaries:	The Pennsylvania Vegetable Growers, PA Apple Growers, PA Mushroom Institute, PA Co-Operative Potato Growers, PA Winery Association, PA Beekeepers Organization and PA Maple Syrup Producers are some Commodity Groups that benefited directly from the successful execution of this project. They were able to not only showcase and sell their products to a wide range of consumers but also educate them on the benefits of using specialty crops as part of their daily menu.
Lessons Learned:	We derive new ideas and targets at the conclusion of each successfully executed event, which we aim to implement in the years to come. In 2017, we plan on inviting Chefs, as well as Specialty Crops Farmers to take the stage together and communicate their passion for using and producing local specialty crops to our audience. Such initiative will spread our message of the importance of specialty crops even better and to a wider demographic.
Additional Information:	For event photos, Chefs' bios and recipes, visit http://www.papreferred.com/culinary_connection
Project 5	Up Regulation Mushroom Defense Mechanisms Against Mushroom Flies
Applicant:	Penn State University Edwin Rajotte 501 Ag Sciences & Industries Building University Park, PA 16802
Project Summary:	Pennsylvania is first in U.S mushroom production, producing nearly 2/3 of the nation's mushrooms. A major threat to mushroom farming is the fly pests, <i>Lycoriella ingenua</i> and <i>Megaselia halterata</i> . The larvae of these flies reduce yields, they also vector serious fungal diseases highly detrimental to mushroom production (eg. Green Mold caused by <i>Trichoderma aggressivum</i>). This fly/pathogen complex causes approximately \$14 million loss per year. Pesticides alternatives against mushroom flies are rare, and there is widespread pesticide resistance. In addition, the mushroom industry has a growing sector of organic production and many growers are transitioning from conventional to organic modes of production. The need addressed with this project was to implement research about an alternative method of fly

	<p>management in mushroom farming, by studying the defense mechanisms of the white button mushroom, <i>Agaricus bisporus</i> against mushroom flies, as a first step to the potential upregulation of these defenses against fly pests as a future methods of pest management. This work is part of the dissertation research of Maria Mazin, PhD student in Penn State's Entomology Department.</p> <p>This project established a much-needed baseline for further research into an alternative pest management approach that does not involve synthetic pesticides and satisfies consumers' concerns about pesticide use in agriculture. No research has been done with the white button mushroom regarding its defense mechanisms towards insect pests, doing so is a first step for developing research on the upregulation of mushroom defense mechanisms as a sustainable alternative to pesticide use in the mushroom industry.</p> <p>If the project built on a previously funded project with the SCBGP or the SCBGP-FB describe how this project complemented and enhanced previously completed work.</p>
Project Approach:	<p>A series of laboratory tests were implemented in order to develop a method for obtaining white mushroom mycelia which could be further used for molecular assays. We were able to develop a mycelia growing protocol in which the mushroom mycelia could be obtained in a pure manner (without growing agar which interferes with the molecular assays, particularly the detection of polyphenol oxidase). This established protocol can be used by other researchers for the quantification of mushroom mycelial defense compounds.</p> <p>In addition, we created baseline data that shows that the white button mushroom does produce a defense response in the form of Polyphenol Oxidase. We also were able to utilize an assay designed for the detection of this protein in plants, in our assays with the mushroom mycelia, proving that this method can be applied to research with mushrooms.</p> <p>Fly fitness bioassays:</p> <p>We also carried out a series of feeding assays to measure the mushroom sciarid fly's performance when feeding on white button mushroom mycelia. The results of these assays were published in the Journal of Pest Science (Mazin et al 2017) and show that mushroom mycelia is more resilient against sciarid flies when it has developed for 14 days. This finding can contribute to future research by establishing that the developmental stage of the mushroom mycelia affects resilience against mushroom flies.</p>
Goals and Outcomes Achieved:	<p>We accomplished a major goal of this term which was to develop a protocol in which PPO could be measured in white mushroom mycelia (through the Bradford assay). <u>With this method, we were able to obtain more <i>A. bisporus</i> mycelia which could be used for the quantification of defense proteins. This method can be used by other researchers when implementing molecular bioassays on white mushroom mycelia.</u></p> <p><u>Two of the proposed goals for this period were not completed:</u> Supplementation assays on mushroom compost. Data on defense activity and biomass collection and mushroom farming trials.</p> <p>However, results from the fly feeding experiment led us to another, more important research direction. This direction expanded the <i>A. bisporus</i> feeding results where we found that the flies did not do well on <i>A. bisporus</i> mycelia, but when <i>Trichoderma</i> was present, the negative effects</p>

of *A. bisporus* were blunted. *Trichoderma* is a pest fungus, a key pest in Pennsylvania mushroom production. We showed a mutualistic relationship between the two key pests. Flies did better in the presence of *Trichoderma* and *Trichoderma* did better in the presence of flies (Mazin et al 2017). These results will impact pest management decision in commercial mushroom production.

Dr. Mazin obtained some results that looked promising, but simultaneously discovered a fascinating mutualism between the sciarid mushroom fly and the *Trichoderma*. She pursued this angle and reasoned that the mutualism could include the fungal suppression of plant defenses, but she did not get a chance to test this hypothesis. Instead she found that:

- There was a fitness benefit for the sciarid fly when larvae develop on spawned mushroom compost parasitized by green mold, including higher adult emergence rate, faster development time from larva to adult and larger adult females (Mazin et al 2017). Fly fitness declined when the compost was fully colonized by *A. bisporus* mycelia and *T. aggressivum* was not present. This suggests that sciarid larvae benefit from the *T. aggressivum* parasitism on *A. bisporus* and the green mold. Benefits may include improved nutrition, defense suppression or pre-digestion.
- Significantly more *T. aggressivum* colonies formed on the dishes when flies were left to vector the pathogen for 30 hrs, as opposed to 18 hrs, indicating that females' 24 hour pre-oviposition period limited fly movement. One gravid female fly was able to initiate up to 32 *T. aggressivum* colonies in a 0.3 m² area. Frass deposits of mushroom sciarid fly larva reared on *T. aggressivum* contained viable spores, detected through fungal subcultures and molecular analysis (PCR), confirming that larvae can also vector the fungus. This study supports the heretofore anecdotal evidence that mushroom sciarid flies are part of green mold disease epidemiology on mushroom farms.
- The ecology and behavior of the mushroom phorid fly outside mushroom farms in the U.S. has not been studied. Maria studied activity and distribution of adult *M. halterata* in the areas surrounding mushroom growing houses using yellow sticky traps. *M. halterata* focuses its flight activity over turf areas rather than windbreaks and spent compost piles, possibly for mating purposes. No evidence was found that *M. halterata* was ovipositing in turf areas surrounding mushroom growing houses. In addition, flight activity was highest in the afternoon until midnight at higher temperatures yet at lower temperatures activity ceased after sunset. Establishing temperature and daylight thresholds for *M. halterata* flight activity may be useful in developing IPM tactics for this species. The most successful IPM tool that mushroom growers use at present is fly exclusion. Exclusion can be improved by focusing farm operations around temperature and daylight thresholds when fly activity is at its lowest.
- Mushroom phorid flies were monitored on 16 commercial mushroom farms in Chester County, PA from August 2016 to August 2017 with the use of light traps. Fly populations began in August, reaching their peak in November and declined drastically during the

	<p>winter and early spring months. Population dynamics within the mushroom crops reveal that flies can invade as early as the first day of spawn run until the stage of casehold. In some crops, emergence was seen as early as 22 days after filling the growing room. In other crops emergence was seen between days 35 and 40 after filling. In some cases an overlap of fly generations occurred within the same crop and in other cases two generations occurred. A linear regression showed that factors such as the distance to neighboring mushroom farms and the number of neighboring farms as well as type of farm construction and steaming practices positively affected phorid fly densities on the farms sampled.</p> <ul style="list-style-type: none"> The Health behavioral model (HBM) was employed to study factors that predict IPM behavior in mushroom farmworkers. We found that high perceptions of risk and control around the spread of pests and pathogens and not IPM knowledge, predict IPM behavior. We conclude that IPM interventions should not be limited to education on mushroom pests and pathogens and should develop ways to encourage farmworkers perceptions of control over mitigating pests and pathogens.
Beneficiaries:	<p>One of the major threats to mushroom farming worldwide is the potentially devastating green mold disease, caused by the fungal pathogen <i>Trichoderma aggressivum</i> ft <i>aggressivum</i> Samuels & Gams (North America) (Savoie at al., 2001; Guthrie & Castle, 2006). The most recent green mold losses in the United States were estimated to be \$14 million dollar in 2011 (Pecchia, 2012). Our project proved that the mushroom sciarid fly <i>L. ingenua</i>, a pest in commercial mushroom farming is a mechanical vector of this disease, a finding which has large implications for the control of the disease through the control of its vector (the mushroom sciarid fly). These findings were shared in multiple meetings with growers where a large representation on the PA industry (there are 68 mushroom companies in Pennsylvania which produce nearly 554 million dollars in mushroom sale revenues) is present as well as in the Penn State Mushroom Short Course.</p> <p>In addition, we worked directly with 12 mushroom companies (spread across 20 farms in total) in efforts to gather data on the mushroom phorid fly, a serious pest that has caused not only green mold disease outbreaks on farms but has been a nuisance to their neighboring residential areas (one main area affected, the Harrogate Adult Living community in Landenberg PA is comprised of 124 homes, most of which were affected by the mushroom phorid fly). We shared and reviewed our data with all participating farms and members from the living communities and jointly worked to create fly control methods suited for farms and homes alike.</p> <p>We presented the results of this project to a mushroom industry audience (mainly mushroom growers) in the 2016 Mushroom Short Course.</p> <p>The beneficiaries of this project were the 12 mushroom companies and the mushroom industry that we presented the short course to.</p>

Lessons Learned:	<p>We learned that there are established protocols (such as the detection of PPO and the Bradford assay) that can be readily applied in assays with mushroom mycelia. This eliminated the need to develop new protocols for measuring this compound. In order to detect and measure this compound in mushroom mycelia, however, it is imperative to obtain large amounts of mycelia. The sample must be in as a pure form as possible (with no agar media) for which the mycelia must be grown using acetate paper on agar, or by some other method (such as liquid media that can later be filtered).</p> <p>One unexpected outcome of this project was the staggered development of the white mushroom mycelia when supplemented exogenously (through sprays) with Methyl Jasmonate (MeJA). We recommend applying the MeJA directly to the mushroom growing media, however further research is needed in order to determine how much of this substance is absorbed and retained by the mushroom mycelia from the media.</p> <p>A challenge of this project is working with such small insects such as mushroom sciarid larvae. Often, in the feeding assays the larvae would burrow into the agar (while feeding on the mycelia) and further use of the larvae was not possible since it could not be found in the media. Feeding assays can potentially be done on a hard surface such as filter paper (on which mushroom mycelia is collected after cultivation in liquid broth). However, we consistently ran into the problem that the sciarid larvae would not feed on mushroom mycelia on acetate paper, which hampered our feeding trials, such a thing may occur with filter paper.</p> <p>Literature cited:</p> <p>Maria Mazin, Stefanos S. Andreadis, Nina E. Jenkins, Edwin G. Rajotte: <i>The mushroom sciarid fly, Lycoriella ingenua, benefits from its association with green mold disease (Trichoderma aggressivum) in commercial mushroom production</i>. Journal of Pest Science 11/2017;; DOI:10.1007/s10340-017-0930-4</p> <p>Maria Mazin , Stefanos S. Andreadis, Nina E. Jenkins, Kevin R. Cloonan, T.C. Baker & Ed G. Rajotte Activity and distribution of the mushroom phorid fly, Megaselia halterata , in and around commercial mushroom farms. April 2019. Entomologia Experimentalis et Applicata DOI: 10.1111/eea.12777</p>
Project 6	Tracking Listeria species in a Pennsylvania Packing House and Development of Strategies to Prevent Post-Harvest Contamination
Applicant:	<p>Penn State University</p> <p>Luke Laborde</p> <p>442 Erickson Food Science Building</p> <p>University Park, PA 16802</p>
Activities Preformed:	<p>GOAL 1: <i>Acquire benchmark data on food safety and sanitation practices and policies in selected Adams County Pennsylvania packing houses and conduct a post-project survey to assess impact.</i></p> <p>In order to acquire a baseline understanding of food safety and sanitation practices among Pennsylvania tree fruit packing operations, we completed site visits to three facilities in Adams County. We learned by observation of the packing environment that there deficiencies in</p>

facilities and equipment design that could possibly be areas where *Listeria monocytogenes* could become established and increase the chances of product contamination. We also found that they were only just beginning to understand the new food safety standards within the Food Safety Modernization Act (FSMA) and how they could affect their operations. The sites we visited were among the larger tree fruit packing operations in the state and all had been subject within the last several years to private food safety third party verification audits mandated by their buyers. From this we can conclude that other smaller sized packing operations will be at this level of knowledge or lower.

GOAL 2: Assess the prevalence, location, and routes of transmission of Listeria monocytogenes in selected tree fruit packing houses in Pennsylvania (microbial survey)

In our work plan we targeted the collection of 100 samples at 3 anonymous packing facilities. We exceeded this by taking a total of 839 environmental swab samples and one off-site controlled atmosphere storage facility each of 6 times over a period between 9/2016 and 7/2017. Only non-food-contact sites were sampled to avoid putting the companies at risk for regulatory action.

Analysis of data and further characterization of *L. monocytogenes* is incomplete. However we can report the following. Among all three facilities, 19% (159 of 839) samples were found to be positive for the presence of *L. monocytogenes*. Greatest occurrence of *L. monocytogenes* was consistently observed in the wet wash and waxing line area and there were differences in occurrence among the three facilities. In general, *L. monocytogenes* increased from lowest levels at the beginning of the study, rose to a peak during the winter months, and then decreased during the spring and early summer months. We tentatively explain these results by the cyclical presence of water and fruit debris in the environment. When packing operations are at their highest level of activity, conditions are most supportive for survival and growth of *L. monocytogenes*. In August of 2017, Dr. LaBorde discussed the results separately with management from each of the packing facility and provided initial recommendations for improving sanitation practices. Each (100%) indicated that had already implemented some improvement such as establishing regular cleaning schedules, consulting with chemical company representatives to purchase cleaners and sanitizers, and took measures to minimize the presence of water in the wash and wax line.

We do not have a good understanding of why one particular packing facility had a greater occurrence of the pathogen since all three had similar packing line equipment and operation procedures. However we are confident that we will be able to build on these results as additional funds were obtained from another grant program that will allow us to analyze isolates to the strain level using whole genome sequencing techniques for the next 3 years.

GOAL 3: Demonstrate increases knowledge, skills, and intent to improve sanitation practices among tree fruit packing personnel in Adams County, Pennsylvania.

On March 31, 2017, Penn State Extension presented a one-day workshop in Biglerville, PA to 39 members of the fruit packing and allied industries titled “Controlling *Listeria* in Fresh Produce: Tree Fruit Packing Operations”. The morning session was held at the Penn State Fruit Research

	<p>and Extension Center where lectures were presented on 1) Microbial characteristics of <i>L. monocytogenes</i>; 2) <i>Listeria</i> sources, harborage sites, and routes of contamination, 3) Basics of cleaning and sanitizing; and methods to verify adequate sanitation processes. The second lecture, presented by Dr. LaBorde consisted of a preliminary summary of the microbial survey data. Mr. Mark Seetin, Director of Regulatory & Industry Affairs for the U.S. Apple Association and Mr. Donald Jones, Business Development Manager for Foam-It Inc. and who has extensive experience working to develop sanitation protocols with Washington state packers, provided national perspectives on food safety issues in the tree fruit industry. The afternoon session moved to the Rice Fruit Company packing facility where participants were assigned to three break out activity groups. Topics covered through hands-on demonstrations were 1) Foam cleaning of roller brushes & adjacent areas, 2) Verification of cleaning effectiveness using ATP bioluminescence testing, and 3) Monitoring for the prevalence of <i>Listeria</i> in the packing environment. Evaluations, returned at the end of the program demonstrated consistently high scores (6-7/7) for the workshop demonstrating very high levels of satisfaction. All participants (100%) indicated that they learned something new or gained a new skill. We found this activity to be particularly of value to us because we were able to gain an understanding of current industry practices, challenges faced in meeting new food safety standards, and we were able to establish communication channels that we will use as our overall tree fruit safety programs advance into the future.</p>
Problems and Delays:	<p>As stated in an earlier annual report, we were unable to hire a qualified graduate student until January of 2016 which delayed spending in the personnel category. We requested a no-cost extension to allow us to spend out these funds to support his research until the end of the project (confirmation of NCE to 9/30/2018 received on 11/10/17).</p> <p>We found that the funds from the SBCG program were not sufficient to cover the extensive travel and supply costs required to reach out 12 times to each of 3 packing facilities that are, on average, 200 miles from the Penn State campus. We overcame this by leveraging our support from the Specialty Crops Block grant to obtain funds from 2 other sources that will allow us to continue our overall integrated research and extension tree fruit food safety program for the next 3 years.</p>
Future Project Plans:	<p>We will replicate our microbial survey during the 2017-2018 tree fruit packing season. The graduate student will also complete studies to determine the potential for growth and survival of <i>L. monocytogenes</i> on intact and wounded apples. The results from this study will be reported in the final report.</p> <p>We will further reach out to smaller tree fruit packing operations through an email/postcard survey in an effort to more broadly understand the range of policies and procedures used in Pennsylvania.</p>
Funding Expended to Date:	<p>To date, \$66,753.20 has been expended.</p> <p>The project has not gained any income as a result of activities conducted.</p>

Project 7	Marketing and Accessing more Specialty Crops (Local Food Local Treats)
Applicant:	Robert C Junk Jr. 724-246-1536 bjunk@fccaa.org
Project Summary:	<p>By introducing healthy, local, and fresh specialty crop food options through retail outlets, farm market, farmers' markets, a CSA program, and local and regional food banks, the RFEC will increase regional consumption of locally produced specialty crop products and help local farmers expand opportunities for the resale of their fruit and vegetables produce.</p> <p>The project is designed to have multiple beneficiaries. Farmers will benefit from additional purchases and new markets, resulting in heightened income. Local grocers will benefit from enhanced relationships with local farmers while adding locally-grown, high-demand produce and locally produced specialty crop products to their inventory. Consumers will gain access to fresh, locally-grown, nutritious specialty crop produce. Additionally, emergency feeding programs will be able to provide nutritious options to those in need.</p> <p>In aiming to meet the goals and outcomes described below, the RFEC project will:</p> <ul style="list-style-type: none"> ▪ Create 7.5 direct jobs ▪ Retain 10 indirect jobs ▪ Establish 5 to eventually 14, weekly mobile farm markets in food deserts communities ▪ Increase farm market sales by an estimated \$85,000 annually ▪ As a result of SCBG funding, an estimated 20 farmers and/or producers will. <p><u>Describe the importance and timeliness of the project.</u></p> <p>Republic Food Enterprise Center's (RFEC) efforts to increase access to healthy specialty crop foods throughout the southwestern Pennsylvania region. With SCBGP funding, the RFEC will hire 7.5 employees over the two years of the project to expand existing Fayette County farmers' markets by participating and accepting SNAP benefits. This employee will also grow the RFEC's existing Community Supported Agriculture program, which distributes fresh, locally grown specialty crops produce to members on a weekly or bi-weekly basis. Fayette County Community Action is a provider of nutrition education services through its Food Bank, WIC and Senior Center programs will partner to expand education around the importance of fruit and vegetable consumption in the diet.</p> <p>SCBGP funding will also allow the RFEC to produce value-added specialty crop products. Additionally, SCBCP funding will enable the purchase of equipment supplies, setup materials for Mobile Farm Markets, pop-up farmers' markets and CSA distributions (tents, tables, chairs, lawn signs etc.) The funding will also provide the program with marketing tools such as brochures, radio spots, newspapers, and TV ads and other outreach materials that explain and promote the RFEC and its programs. The focus of these promotions will be underserved communities located in food deserts.</p> <p>The RFEC project connects local residents to locally-grown specialty crop produce and specialty</p>

	<p>crop food products. Through the RFEC, local produce is sourced directly from farmers and sold commercially, converted into a value-added specialty crop product, sold directly to consumers, and sold or donated to emergency food programs. This comprehensive center will benefit all parties involved. Farmers will benefit from guaranteed purchases of Specialty Crops and the resulting heightened income. Local grocers will benefit from enhanced relationships with local farmers while adding locally-grown, high-demand specialty crop produce to their inventory. Consumers will gain access to fresh, locally-grown, nutritious specialty crop produce, and emergency feeding programs will be able to provide nutritious options to those in need.</p>
<p>Project Approach:</p>	<p>The RFEC, Fayette County Community Action Agency, and Fay-Penn Economic Development Council have established the Fayette County Food Council. The Food Council has been dedicated to the local food supply, establishing a food co-op, developing and expanding the Buy-Local program, promoting healthy eating habits and diets, and Specialty Crop food-related issues.</p> <p>Through the food council and networking efforts have successfully increased outreach in low income communities and in public awareness of specialty crop nutritional value to them.</p> <p>We strategically held farmers markets that offered specialty crops and value-add products made from specialty crops at the East End United Community Center, the Uniontown Adult Recreation Center, the Homestead Farmers Market and Republic Food Enterprise Center Market in Republic PA. We reached over 1,500 families last summer many of whom were low income. Through mobile markets, the RFEC was able to take farmers markets to low income, underserved consumers. The RFEC vans visited senior centers and community centers throughout Fayette County. Historically, these locations are some of the hardest areas to reach and provide residents with fresh produce. We reached over 1,200 senior families and this initiative enabled the RFEC to provide residents with fresh produce.</p> <p>The RFEC is currently working with 60 farmers, 16 entrepreneurs/multiple businesses to source, aggregate, or produce products.</p> <p>Additionally, we increased our outreach effort by partnering with non-profit organizations and programs that work to improve nutritionally awareness and increase access to healthy and fresh specialty crop foods such as WIC and the local food banks.</p>
<p>Goals and Outcomes Achieved:</p>	<p>GOAL 1: Work with regional farmers on specialty crop planning and source specialty crop produce accordingly.</p> <p>OUTCOME: Farmers are provided with new markets for product, a contracted source of income for their produce, and the opportunity to benefit from value-added production.</p> <p>a. Progress Made:</p> <p>The Republic Food Enterprise Center (RFEC) has made great progress in promoting the RFEC as a marketing resource to local and regional farmers in Southwest Pennsylvania. In the last three years we have directly reached over 8,500 consumers, with nearly half (4,200) of those</p>

consumers reached just this past year. Our farmers market, our main tool for the marketing and sale of specialty crops products, participated consistently in 12 farmers markets this year from June through October as follows; Bethel Park Farmers Market, East End Community Farm Stand, Liberty Center Farm Market, Homestead, Uniontown Farmers Market, Ligonier Farm Market, Connellsville Farm Market, Shady Side Farm Market, Uniontown Hospital Farm Stand, Uniontown Senior Center, Masontown Farm Stand, and Christian Klay Farm Stand.

b. Impact on Community:

We have raised RFEC brand awareness throughout SW Pennsylvania, gaining credibility and increasing our presence throughout the region. This has resulted in an improved market, increasing sales of value added products as well as fresh fruits and vegetables sourced from farmers. Our farmers markets continue to become more profitable and serve as another method of outreach for the additional services our organization offers including our shared use kitchen, business startup initiation and support services, Community Supported Agriculture Program, Farm to Table Catering Services, and a new \$1.75 Appalachian Regional Commission (ARC) Power initiative designed to further boost agricultural production in the region.

Additionally, the General Manager and Marketing Director is continuing to discuss the national school lunch program and the addition of local farm-fresh IQF value-added bulk vegetables to help keep tray cost down.

GOAL 2: Work with emergency food networks to collect, buy, and distribute surplus specialty crop produce to the food bank network, and process specialty crop items into products with a longer shelf life for distribution to low income households

OUTCOME: Food bank participants receive fresh, locally sourced specialty crop foods and specialty crop food products. Food is converted from fresh produce into value-added specialty crop products.

a. Progress Made:

The RFEC continues to utilize its delivery vans to reach food deserts, food banks, low-income neighborhoods, farmers'/pop-up markets, etc., located throughout Fayette and the surrounding counties.

In collaboration with a longstanding partner of RFEC, the Bruderhof Community, and the Fayette County Community Action Food Bank, we were able to collect and distribute over 900 heads of lettuce to food pantries throughout Fayette County.

Additionally we worked with the Pittsburgh Food Bank to repurpose and create a longer shelf life for 500oz of sweet corn which was then distributed to low income families.

Our RFEC kitchen has also been working with Fayette County Community Action Agency's Circles program to provide prepared dinners in support of their programming, feeding 30 low income individuals, once a month, with surplus food, as they learn tools and life skills to help work their way out of poverty.

We also sourced and provided 352 low- income individuals with a \$10 bad of specialty crop produce.

b. Impact on Community:

RFEC recently purchased two vans to support us in our various initiatives. Now utilizing two trucks and two vans we have significantly increased our capacity to pick up produce from farmers, deliver produce to end-markets, operate markets, distribute CSA boxes, create and sell specialty crops value-added foods, and ultimately better serve the regional population. The use of these delivery vans allowed the RFEC to expand.

As we continue our efforts to promote the economical, physical and environmental health of our community and work towards a sustainable solution to issues involving hunger and malnutrition, we also work with community based organizations and local food banks to attempt to provide emergency hunger relief to the many food insecure families living in the region.

GOAL 3: Work with nutrition education providers and service delivery organizations to expand education to low income residents.

OUTCOME: Low-income individuals and communities become more self-reliant, purchase fresh specialty crop produce, and prepare healthier specialty crop foods.

a. Progress Made:

This year we worked with Fayette County Community Action Agency to develop easy to prepare recipes using fresh local specialty crops ingredients that could be found at our farmers markets. When Fayette County Community Action Agency would distribute Farmers’ Market Checks to senior clients and WIC clients, they would also distribute recipe cards designed to provide them with information fit for their specific needs. Low income residents in our community face many barriers. Some residents don’t have the space to store fruits and vegetables, while others don’t have to utensils to cook with. In extreme cases, we have residents who don’t have stoves or electricity. The recipe cards we created took into account the various barriers our residents face each day.

c. Impact on Community:

We have estimated that we have reached approximately 145 families with our recipe cards as well as additional cooking materials made available through our partnership with Penn State Cooperative Extension. Additional through the implementation of Serve Safe instruction, our General Manager has certified 6 students to become leaders in the kitchen.

This summer the RFEC partnered with Experience WORKS, a youth employment program that offers employment and training opportunities to low income youth ages 16-24. The program is funded through the Westmoreland Fayette Workforce Investment Board. Youth received onsite training and job experience in the warehouse and at the farmers markets.

GOAL 4: Source, aggregate, process, and sell value-added local specialty crop produce and

value-added specialty crop food products into regional food deserts, to restaurants, schools and other institutions promoting a comprehensive response to local food access, farm and nutrition issues.

OUTCOME: Members of multiple food sectors have increased access to locally produced nutritious foods. Regional communities become more self-reliant in meeting food needs.

a. Progress Made:

RFEC has developed an extensive network of partnering producers, businesses and EMOs. These partners use the center to make value added products, create recipes, test recipes, buy and sell produce, and purchase products. We also work with a number of producers to create specialty crop value added products. In working with individual growers and producers we have been able to create an array of specialty crop products including

pickles, relishes, sauces, spice rubs, sauerkraut, spaghetti sauce, chili base, jarred seasoned peppers, BBQ sauce, jelly, beets, salsa, pies, and many sauces. Additionally, we minimally process the following for resale; corn, potatoes (for French fries) and fruit. We continue to work with Jordan Banana to aggregate and distribute produce.

The RFEC has been able to recruit additional farms/organizations. Those farms include: JPS Farm and Market in Scottdale, PA; Lords Farm in Madison, PA; Logan Farm in Irwin, PA; Milroy Farms in Somerset, PA; Mobilia Farms in North East, PA; Burnt Cabins Grist Mill in Burt Cabins, PA; Country Side Produce Auction Salisbury, PA (they work with over 20 farms in the region). In addition to the new farms, the RFEC is working with Laurel Vista Farms, Hill top Growers, and Christener Farms to produce value-added products. The RFEC continues to work with Jordan Banana Company and Fredericktown Butcher Shop to enhance their respective product lines - adding more fresh local produce.

In addition, the RFEC created six new “food-related” businesses - Jones Foods, Inc.; Abundance Foods, LLC; Hawee Style-BBQ; My Pop’s Specialty Foods; Glenn’s Cookies; and Ideal Grain Free Granola.

We create specialty crop value added products for the following companies: Harvest Valley Farms, Art King; Sava View; Laurel Vista Farms; Emerald Valley; Golden Harvest Acres; Cucina Calabrese; Larry Roby

The following companies use our shared use kitchen to prepare, cook, and package their products: Glenn Cookies; Ernie’s; Mr. G’z; Nancy Bee’s; Hawgee Style BBQ; Sheffer’s Market; Tracy Cotton; Co-Co Elite.

b. Impact on Community:

We have doubled the number of clients we are working with and continue to increase awareness surrounding the Farm to Table movement, nutrition education, a healthy local economy, and increased access to nutrition in our area. We have created jobs and contributed to the local economy.

GOAL 5: Work to expand farmers’ markets throughout the Fayette County area by accepting SNAP benefits and by implementing pop-up markets in food deserts

OUTCOME: Residents have increased access to fresh, locally-grown and affordable specialty crop produce.

a. Progress Made:

Previously, the RFEC has added the farmers’ market voucher program (PA Department of Agriculture – Farmers Market Nutrition Program). The RFEC has expanded these services into Homewood and Homestead (both food deserts) in Allegheny County. In addition, the RFEC has provided and increasing number of markets each month throughout the service area during the growing season. RFEC has successfully implemented the use of a digital Point of Sale system that allows us to accept SNAP benefits at all Farmers Markets. We ensure a sign is prominently displayed at each of our markets letting the public know that SNAP benefits are welcome. Additionally we accept and partner with local agencies to promote the use of WIC and Seniors Farmers Market Checks.

b. Impact on Community:

RFEC has serviced over 1,000 SNAP recipients at various Farmers Markets this past year. Ensuring the underserved individuals and families in our community has consistent access to adequate nutrition helps mitigate other health and social disparities. Additionally, the opportunity to access fresh produce from local farmers provides a sense of community while positively impacting the local economy.

In addition to ensuring the use of EBT cards at the various farmers markets that exist, we ensured pop-up markets took place in food deserts throughout Southwestern PA where residents often lack adequate transportation to travel to a local market for fresh produce. We also placed pop up markets at the Uniontown Hospital and Liberty Center in Pittsburgh. Attendance at markets was overwhelming. Senior participation was huge as about 500 seniors used their SNAP benefits or Farmers Market Checks. We supported Fayette County’s WIC program by strategically placing pop-up markets outside of their office locations in an effort to enhance WIC participants use of their Farmer’s Market checks. This strategy also proved successful.

GOAL 6: Operate and expand a Community Supported Agriculture (CSA) program.

OUTCOME: Regional residents gain access to fresh, high-quality specialty crop produce through the CSA program.

a. Progress Made:

Participation in our Community Supported Agriculture Program has been less than desired. As a low-income community, many residents are not willing to pay the “buy-in” cost associated with the program. We likely have not targeted the correct population and are currently beginning a new marketing strategy for the program. Additionally we are considering ways in which we can encourage SNAP recipients to purchase weekly CSA shares. Previously we partnered with Fayette County Community Action Agency, Inc. to supply 650 Community Supported Agriculture (CSA) program bags to Uniontown’s underserved communities. The program was implemented in the East End neighborhoods of Uniontown, Pennsylvania. These neighborhoods (East End,

	<p>Gallatin Avenue, and LaFayette – Census tracts 42051262300 and 42051261900) are frequently identified as the most challenged areas of Fayette County. We would like to try to implement a system in which we can continue to offer this through SNAP benefit or a grant funded program. We will also market the CSA program in more affluent areas such as downtown Pittsburgh's Liberty Center where we host a Farmers Market and lunchtime catering twice a week to business men and women. This will likely increase buy- in and help improve outcomes for our program.</p> <p>b. Impact on Community: The CSA program has had little impact on the community in the past 6 months but we feel as we have raised RFEC brand awareness and continue to increase our presence throughout the region the potential for a successful CSA program is still existent. We look forward to making this program work and benefit farmers and residents alike.</p> <p>If outcome measures were long term, summarize the progress that has been made towards achievement. Provide a comparison of actual accomplishments with the goals established for the reporting period. Clearly convey completion of achieving outcomes by illustrating baseline data that has been gathered to date and showing the progress toward achieving set targets. Highlight the major successful outcomes of the project in quantifiable terms.</p>
Beneficiaries:	<p>Partnerships that also benefited include the Uniontown Redevelopment Authority, Connellsville Redevelopment Authority, Fayette County Cultural Trust, East End Community Center, Masontown Matters and the Ligonier Farmers Market Association. Additionally we have strengthened partnerships with the Southwestern PA Division Chief of the PA Department of Agriculture, Pittsburgh Farm to Table, Farm Aid, Good Taste Pittsburgh, and Liberty Center. Other significant partnerships that have helped us in our Specialty Crop efforts include Greene County Department of Economic Development, PA Department of Agriculture, Fayette County's Redevelopment Authority and the Fayette County Chamber of Commerce. Other relationships with organizations such as Rural LISC, the Community Action Partnership, Policy Link, the Food Trust, and the C.S. Mott Group for Sustainable Food Systems at Michigan State University, the PA Association of Sustainable Agriculture, and California University of PA continue to grow stronger.</p> <p><u>Clearly state the number of beneficiaries affected by the project's accomplishments and/or the potential economic impact of the project.</u></p> <ul style="list-style-type: none"> i. Number of direct jobs created: 8 ii. Number of jobs retained: 30 iii. Number of indirect jobs created: 4 iv. Number of markets expanded: 7 v. Number of new markets established: 6 vi. Market sales increased by \$20,500 and increased by 110%. vii. Number of farmers/producers that have benefited from the project: 27 viii. Percent Increase: 75%

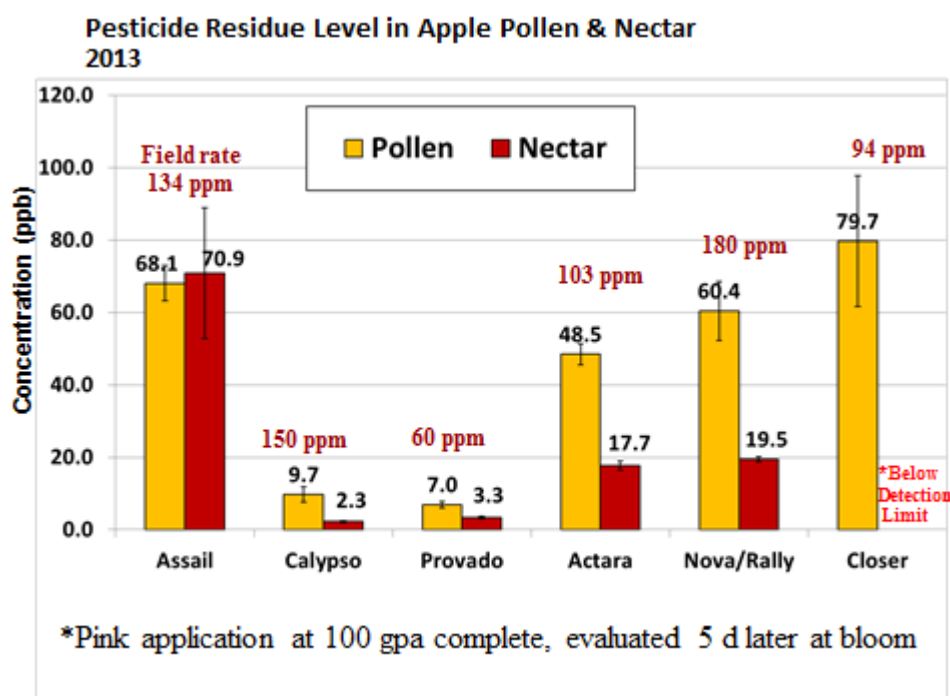
<p>Lessons Learned:</p>	<p><u>Offer insights into the lessons learned by the project staff as a result of completing this project. This section is meant to illustrate the positive and negative results and conclusions for the project.</u></p> <p>While we have greatly grown our network of support over the past year and established a routine and schedule for the 2018 season, we have learned that we need to allow more time for planning each aspect of our market program; from identifying and confirming farmers who we will be purchasing specialty crop produce from to details surrounding marketing our program. There are many components that go in to making our markets run smoothly and many of them were learned along the way.</p> <p><u>Describe unexpected outcomes or results that were an effect of implementing this project.</u></p> <p>Our farmers markets have been a great asset for the community and we will continue to host them and expand our reach beyond Fayette County. They have also been a great marketing tool for other initiatives that RFEC has moved forward in the community, raising awareness of specialty crops usage and of the need to strengthen the agricultural community in the region. Because of this project, we have leveraged funds to support a Farm to School initiative as well as an ARC Power grant. These projects will continue to strengthen the agricultural economy in SW Pennsylvania, creating jobs and supporting farmers while providing local specialty crop food to residents throughout the region. Because of the success of our farmers markets we opened a permanent store in Republic PA which provides nutritional relief in an area defined as a food desert. Another permanent store will open in Masontown in the coming months. Additionally we opened a seasonal holiday store in the Uniontown Mall. In 2018 we will host 4 additional stationary farmers markets and 4 additional pop up markets at senior centers, creating 6 new jobs and retaining 38 jobs.</p> <p><u>If goals or outcome measures were not achieved, identify and share the lessons learned to help others expedite problem-solving.</u></p> <p>The area that we felt that we did not achieve our goals is in the CSA program. We think that the cost was a major issue considering that many of the individuals we reach are underserved and could afford the CSA program. This year we are looking at the potential for individuals to be able to use their SNAP benefits every week to purchase a CSA bag. Additionally, we will reach out to various communities we may not normally</p> <p><u>Lessons learned should draw on positive experiences (i.e., good ideas that improve project efficiency or save money) and negative experiences (i.e., lessons learned about what did not go well and what needs to be changed).</u></p> <p><u>Positive:</u></p> <ol style="list-style-type: none"> 1. Increase nutrition education for consumers 2. Increase opportunities for education surrounding the preparation and cooking of local produce (collaborate with schools in area to support this effort) 3. Increase attendance of farmers at markets growing specialty crops 4. We found mobile markets in and around senior centers were successful and greatly benefited the senior populations as well as our market sales of specialty crops.

	<p><u>Need Some Change?</u></p> <ol style="list-style-type: none"> 1. Strategize with specialty crop farmers on ways to help them successfully attend markets 2. Because farmers are understaffed- find ways RFEC can support them at markets, wholesellers, and Restaurants owners. 3. We need more farmers in our area to purchase greens from.
Project 8	Understanding & Minimizing the Ingestion of System Insecticides into the Nectar and Pollen of Commercial Apple Orchards
Applicant:	<p>Penn State University David Biddinger 290 University Drive Biglerville, PA 17307</p>
Project Summary:	<p>Pennsylvania, New York and many eastern apple orchards are now using greatly reduced rates of honey bees and over half not paying honey bee hive rentals but are relying completely on the 50+ wild species of bees that we have identified pollinating apple and other tree fruit in Pennsylvania. Reliance on wild bees has the advantage of being mostly free, but adds another layer of complexity to our IPM programs and the use of pesticides. Unlike honey bee hives, they can't be moved in and out of an orchard before and after the 7-12 days of apple bloom, may be present in and adjacent to orchards for their entire 4-6 week flight period. We have published data to show that some of these wild bees such as the mason bees have different levels of susceptibility to pesticides than the honey bee upon which all pesticide registration data is based. Conservation of the 200+ of the 350 known species of Pennsylvania bees that we have found in 6 years of monitoring tree fruit orchards will be important not only for fruit production, but in maintaining bee biodiversity in a time of general decline both in the US and worldwide.</p> <p>Many consider pesticides to be a major component in the decline of honey bees and some wild pollinators. This has led to much controversy and disagreement between the public, wildlife conservation groups, and bee keepers who blame fruit growers for trying to meet the quality and quarantine standards necessary to market their crop both domestically and for export. Despite a general consensus amongst researchers that CCD is caused by multiple factors such as new diseases, parasites, nutrition, and the stress of interstate transportation, the media and other activists have concentrated their efforts to blame the class of systemic insecticides known as the neonicotinoids and some important fungicides. Unilateral demands for banning these and other pesticides have been made without understanding how pesticides are used in an IPM framework for specific crops and especially for the more pest diverse and IPM intensive programs in high value perennial crops such as tree fruits. Even more troublesome is that much of the data is centered on the detection of pesticide residues at any level rather than determining the toxic effects on bees at those levels. When toxicity is considered, however, it is almost always based on laboratory data using technical grade pesticide dissolved in acetone rather than formulated pesticides in water like it is used in the field. Many of these lab studies also do not follow the proper bioassay procedures necessary to develop valid dose/mortality</p>

curves that are necessary truly understanding impacts on pollinators at the community level.

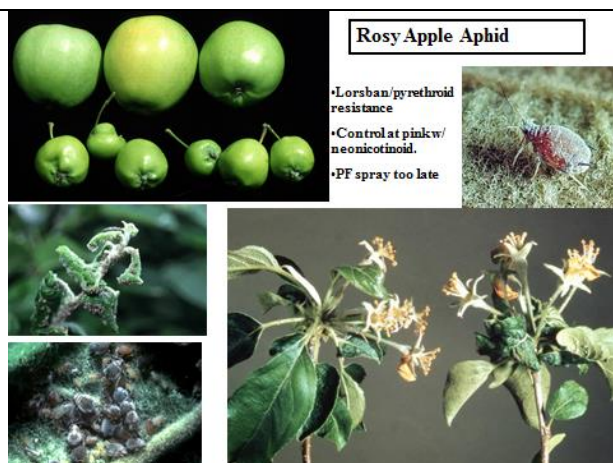
Project Approach:

There has been relatively little research conducted on solitary bees other than a few contact bioassays. This type of bioassay is useful in understanding bee response if they are sprayed while actively foraging at bloom, but apples are not sprayed with insecticides during the relatively short 7-10-day bloom period. The main means of pesticide exposure is through the systemic movement of some insecticides and fungicides through the vascular system of the plant from pre-bloom sprays. Previous work by the investigators had already determined the realistic field exposure levels of bees to some systemic insecticides and fungicides that were applied pre-bloom in apple orchards. Residue analysis of nectar and pollen samples taken during bloom, found pesticide levels that were 1,000 to 10,000 times lower than what was directly applied to the trees by farmers. These levels are currently thought to be harmless to honey bees in short duration (24-48 h) acute ingestion exposures, but the effects of these pesticide levels on solitary bees are not known. We, therefore, used the easily reared and managed Japanese orchard bee (JOB), *Osmia cornifrons*, as a surrogate for ingestion bioassays representing the effects on wild bees. JOB was introduced by USDA into Pennsylvania for apple pollination and has since become established and a common pollinator of many types of tree and small fruits in the mid-Atlantic states.



Our overall goal is to minimize the impact of systemic insecticides (i.e. neonicotinoids) and certain fungicides on both honey bees and the many species of wild pollinators that many tree fruit are at least partially dependent on for crop production. The data we generate, however, will also be useful for protecting pollinators in other crops and may help to conserve some pollinator species whose populations are in decline or which may even be threatened with

	extinction (i.e. some species of bumble bees).
Goals and Outcomes Achieved:	<p>1. Verify the best pre-bloom timing and pesticide choice for controlling the pesticide resistant rosy apple aphid that will reduce potentially harmful pesticide residues in the flowers during bloom, but still give acceptable control of this key pest.</p> <p><i>Mitigating residues in nectar and pollen to pollinators while still controlling Rosy Apple Aphid (RAA)</i> – Neonicotinoids are key components of resistance management programs in many crops including apple where we have organophosphate and pyrethroid resistant RAA. Neonicotinoids are also often the ‘soft/selective’ choice to promote IPM because some of the products are not only safer to bees than some of the alternatives, but also safer to some of the predators and parasitoids of secondary pests such as spider mites, woolly apple aphid and San Jose scale that prevent “flare-ups” of these pests. This safety to biocontrol comes from the characteristic of systemic activity, whereas, surface residues are quickly absorbed into the vascular tissues of the plant and quickly dissipate as surface residues. It is this systemic movement into plant tissues which unfortunately also puts bees that consume plant products (nectar and pollen) at risk of exposure. Complete elimination of neonicotinoid use in apple would require the use of non-IPM friendly products such as pyrethroids or the few less human-safe organophosphates and carbamates that are left. The substitution of these alternative products would increase human health risks in terms of farmworker exposure and dietary risks to the consumer. For growers, the secondary pest flare-ups have already seen where farmer used pyrethroids and carbamates to control the invasive Brown Marmorated Stink Bug (BMSB) in the past. Interestingly enough, the neonicotinoid dinotefuron was the least disruptive to IPM of the effective BMSB control options. We estimate that elimination of all neonicotinoid insecticides in apple would result in 2-3 additional pesticide applications due to loss of biological control and a cost of \$100-200/acre to growers until more bee-safe and pest effective pesticides options are developed.</p> <p>The greatest use of neonicotinoids in Pennsylvania apple has been for pesticide resistant RAA control and an occasional spray mid-season for potato leafhopper or green apple aphids. Unfortunately, the damage from RAA occurs during bloom and results in stunted, pygmy fruit that are not marketable (See figure below). Applications made after bloom will not prevent this injury and the previous recommendations for control were to spray only 5-7 days before bloom to improve RAA control.</p>



We have been re-examining the control timing for RAA to include an earlier pre-bloom timing for pest efficacy and to determine whether it would minimize pesticide residues present in the nectar and pollen for the bees. The results in 2013-14 have been verified with an additional 29 pesticide treatments in research orchards in 2015-16 season. The data clearly show that moving the spray timing for RAA control from the pink stage to a 10-12 day earlier at the half-inch green growth stage gives the same level of control of RAA as the previous pink stage application. For all pesticides tested, this earlier timing at ½ inch green greatly reduces the levels of insecticides and fungicides found in the pollen and nectar at bloom. With some pesticides this reduction was even below the 2 part per billion (ppb) detection level. It was surprising to find the near-neonic product Closer (sulfoxiflor) did not move into the nectar as did the other products and was only found in the pollen. While the origins of tissue for nectar production are derived from phloem in which most neonicotinoid products are translocated in, apparently the chemical structure of sulfoxiflor prevents it from moving as do the other products into the nectaries. We also confirmed for a second season that trees sprayed with the common systemic fungicides dodine, myclobutinol, and fenbuconazole could also be found in the nectar and pollen at low levels, but follow a similar pattern of residues being reduced or eliminated with increased application time before bloom.

As part of a search for a neonicotinoid alternative in case of elimination and as a rotation partner for resistance management, several of the field trials have been testing the novel compound Beleaf (flonicamid), which is currently thought to be bee-safe despite being very systemic. Control of RAA with Beleaf under high population pressure has not been as consistent as with some of the neonicotinoid products, but it is promising.

The following table summarizes the products that have been field tested for both RAA efficacy and current safety rating based on known bee toxicity and residue levels found in the nectar and pollen.

Pesticide Name	Common Name	Current Recommendation for Bee Safety Pre-Bloom + safe, - bee toxic

Assail	acetimidiprid	+
Calypso	thiacloprid	+, but voluntarily cancelled 2015
Sivanto	flubendipriferone	+
Acatara	thiamethoxam	-
Provado	imidacloprid	-, not labeled pre-bloom
Belay	clothianidin	-
Closer	sulfoxiflor	-
Scorpion	dinotefuron	special registration for fall BMSB use only
Beleaf	flonicamid	+, non-neonic replacement

2. Conduct ingestion bioassays with honey bees and mason bees over a longer exposure period to determine if residue levels from field samples are actually toxic.

Penn State student Sarah Shugure who graduated in the spring of 2016, outlines in her M.S. entomology thesis detail the difficulties we have had in developing a bioassay methodology for JOB in 2015. These include the adults chewing through testing cages and not feeding on pesticide treated sugar water, in addition to working with a univoltine bee which is only active as an adult for about 4 weeks in the early spring. In contrast, her bioassays on honey bees with the same products were very simple and easy to conduct. A new Ph. D. student, Ngoc Phan, however, learned from the previous trials and developed a bioassay that worked for JOB and repeated the work in 2016. Below are some of the data from both of their work when 50 bees were tested for each of 5-6 concentrations of the various pesticides and mortality was observed at 48 hours.

Fig. 1 Actara (thiamethoxam) 48 Hour Ingestion Mortality – Honey Bee

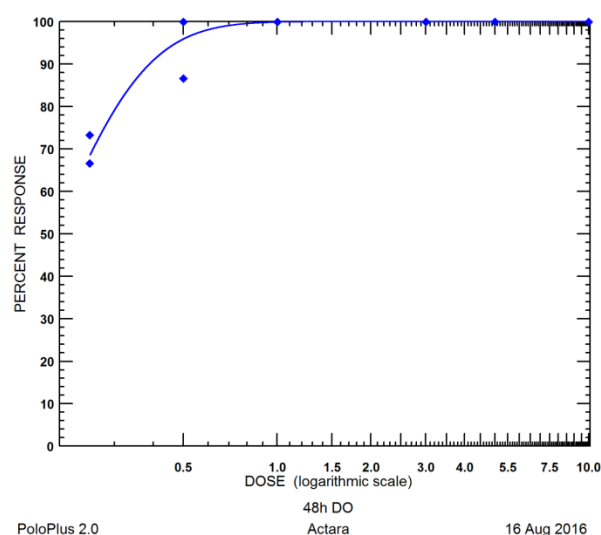


Fig. 2 Actara (thiamethoxam) 48 Hour Ingestion Mortality – Japanese Orchard Bee

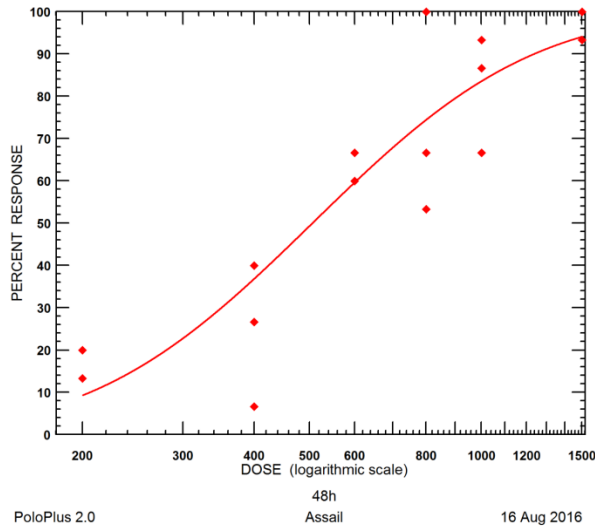


Fig. 3 Assail (acetimiprid) 48 Hour Ingestion Mortality – Honey Bee

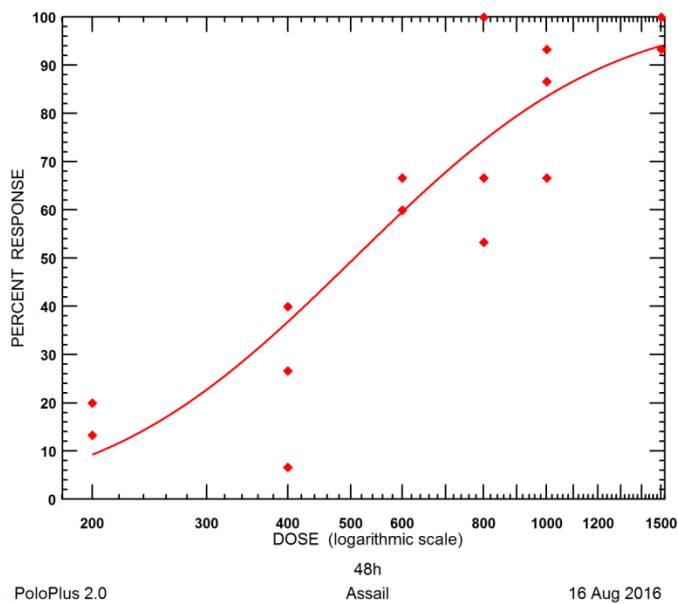
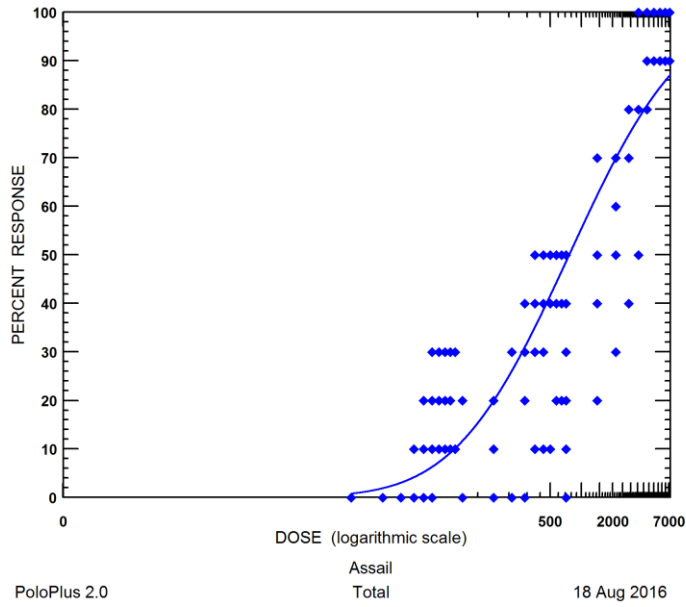


Fig. 4 Assail (acetimiprid) 48 Hour Ingestion Mortality – Japanese Orchard Bee



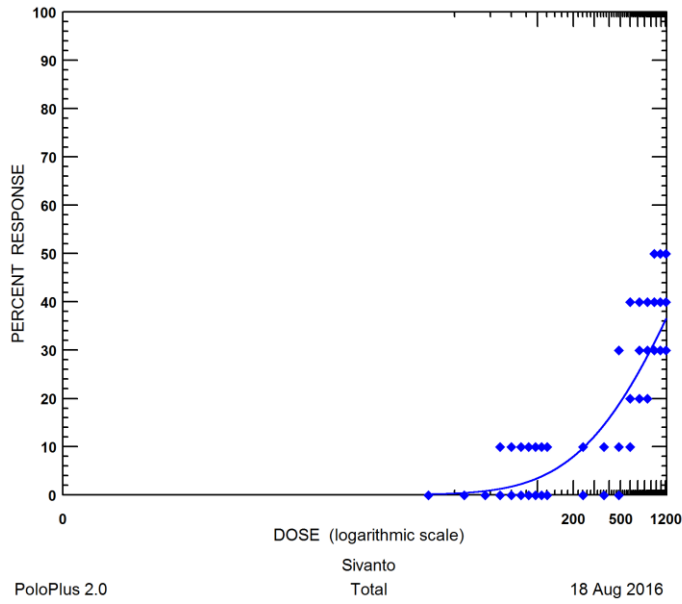


Fig. 7 Beleaf (flonicamid) 48 Hour Ingestion Mortality – Honey Bee

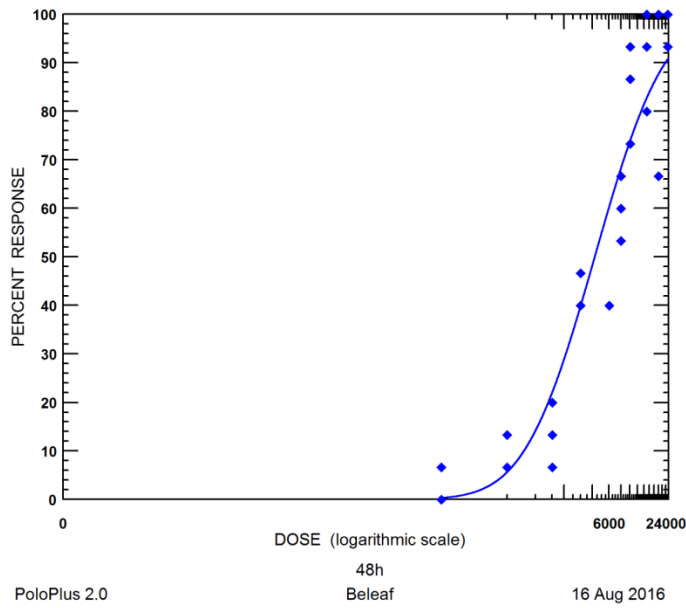


Fig. 8 Rally (myclobutinol) Fungicide 48 Hour Ingestion Mortality – Japanese Orchard Bee

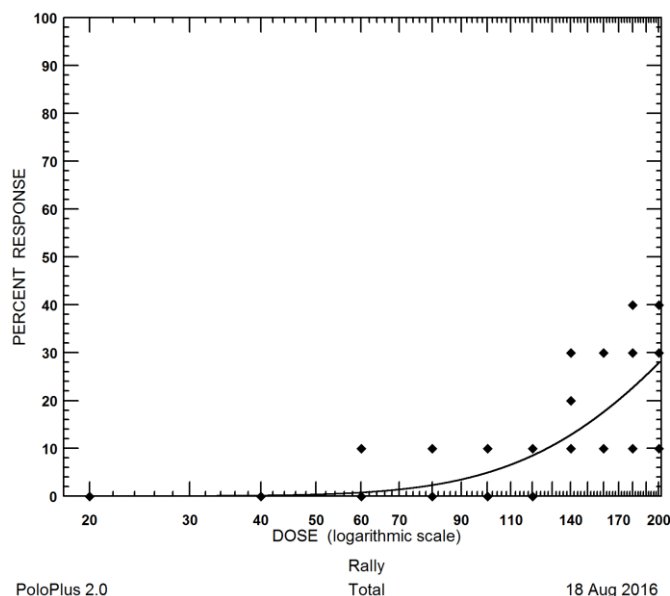
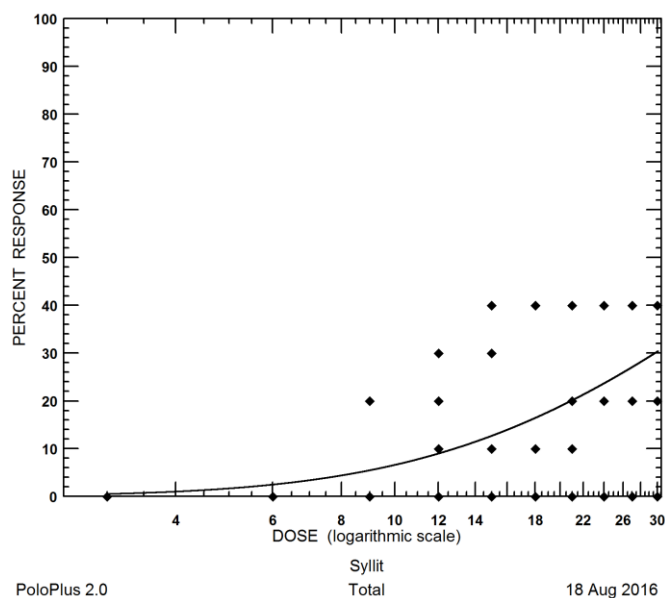


Fig. 9 Syllit (dodine) Fungicide 48 Hour Ingestion Mortality – Japanese Orchard Bee



Also tested was Closer (sulfoxiflor), but mortality was much higher than expected with published data for honey bees and valid dose-mortality curves could not be generated for this product for either type of bee. Beleaf was also tested and was found to be very safe to the honey bee and essentially non-toxic to JOB. While the data still has to be thoroughly analyzed for statistical comparisons between bee species, in general it appears that JOB is less susceptible to most pesticides than the Honey Bee. Previous work by the investigators on contact activity of many of these same compounds on both bee species had shown that the toxicity of water soluble formulated product as used in the field was 10-100 times less toxic

than the current EPA method of evaluating technical product in acetone. This was thought to be due to acetone being a penetrant that acted as a penetrant to get the products directly into the bee through the generally water insoluble cuticle. Also the response of both types of bees was very different, again pointing out that using the honey bee to represent all bee responses to pesticides as in error. During the ingestion bioassays, however, it was found that the published EPA data on most pesticides under-estimated mortality when formulated product was used compared to the standard technique of again technical pesticide dissolved in acetone or alcohol. Other researchers have found that some of the so-called ‘inert’ ingredients in formulated products were actually toxic by themselves or synergized toxicity in bees. Pending further bioassays and analysis of this data, that is what we think is happening our ingestion bioassays and due to the increased water solubility that formulated products have that may increase digestion rates. This could be an important finding in trying to relate laboratory studies under EPA guidelines with actual field data using formulated products.

3. Development of Bee Friendly IPM Programs in Tree Fruit. Results from these studies would be integrated into the Pennsylvania Tree Fruit Production Guide IPM recommendations to our growers, in extension presentations. Development of a USDA-NRCS Pollinator Conservation IPM standard would be developed with the Xerces Society for Invertebrate Conservation similar to those we have already developed at:
<http://extension.psu.edu/pests/ipm/resources/nrcs/programs/conventreefruit> .

The Penn State Tree Fruit Production Guide 2016-17 at <http://extension.psu.edu/plants/tree-fruit/tfpg> now has several chapters now deal explicitly with protecting pollinators and biocontrol agents from pesticides (along with tables ranking toxicity). Additionally a guide to Eastern Apple Pollinators developed by Xerces, Penn State and Cornell has been updated with pesticide safety ranking for bees in 2015 (see below) and is available at: <http://www.xerces.org/wp-content/uploads/2009/11/Wild-Pollinators-of-Eastern-Apple-Orchards1.pdf>

TOXICITY OF PESTICIDES TO BEES
(NOTE: TOXICITY RATINGS BASED ON HONEY BEE TESTS)

Disclaimer: These data mostly incorporate studies looking at acute, short-term adult toxicity. The effects on other life stages (from feeding on contaminated pollen) might be different in chronic exposure. For example, larvae exposed to some GIs could have developmental and reproductive effects including reductions in fecundity and fertility. Also, effects on non-honey bees, pollinating insects are not well known.



TOXICITY LEVEL

CHEMICAL CLASS/GROUP	EXAMPLES OF COMMON NAMES	EXAMPLES OF TRADE NAMES	NON	LOW	MODERATE	HIGH
CARBAMATES	oxamyl	Vydate				
	carbaryl, methomyl	Sevin, Lannate				
NICOTINOIDS	clothianidin, imidacloprid, thiamethoxam	Clutch, Provado, Actara				
	acetamiprid, thiacloprid	Assail, Calypso				
ORGANOPHOSPHATES	azinphos-methyl, chlorpyrifos, diazinon, dimethoate, malathion, methidathion, phosmet	Guthion, Lorsban, Diazinon, Dimethoate /Dimate, Malathion, Supracide, Imidan				
CHLORINATED HYDROCARBON	endosulfan	Thiodan/Thionex				
PYRETHROIDS	bifenthrin, cyfluthrin, deltamethrin, esfenvalerate, fenpropathrin, lambda-cyhalothrin, permethrin	Brigade, Baythroid, Decis, Asana, Danitol, Warrior, Ambush/Pounce				
	pyrethrum/pyrethrin	PyGanic				
INSECT GROWTH REGULATORS (IGRs)	methoxyfenozide, tefufenozide	Intrepid, Confirmer				
	buprofezin, pyriproxyfen	Applaud/Centauro, Esteem				
	novaluron	Rimon				
DIAMIDES	chlorantraniliprole, flubendiamide	Altacor, Belt				
MACROCYCLIC LACTONES	abamectin/avermectin, emamectin benzoate, spinetoram, spinosad	Agri-Mek, Proclaim, Delegate, Entrust/Success				
MITICIDES	acequinocyl, clofentezine, etoxazole, fenpyroximate, fenbutatin-oxide, hexythiazox	Kanemite, Apollo, Zeal/Secure, Fujimite/Portal, Vendex, Onager/Luxury				
	spirodiclofen	Envidor				
	bifenazate	Acrامة				
	pyridaben	Nexter/Pyramite				
OTHER INSECTICIDES	formetanate/HCI	Carzol				
	azadirachtin, horticultural mineral oils, indoxacarb, spirotetramat	Ata-Direct/Neemix, Stylet Oil, Azaunt, Movento				
	flonicamid, kaolin clay, potassium salts of fatty acids/soap	Belted, Surround, M-Pede				
	Bacillus thuringiensis, Cydia pomonella granulosis virus	Bt/Dipel, Carpovirusine/Cydy-X				
FUNGICIDES	captan, mancozeb	Captan, Dithane/Manzate/Penncozeb				
	sterol inhibitors, strobilurins	Indar/Nova/Rally/Rubigen, Flint/Soveran				
	lime sulfur, sulfur					
PLANT GROWTH REGULATORS	ethephon, NAA/1-Naphthaleneacetic acid	Ethrel				

Note: On-going research has recently shown that even the inert ingredients that are part of the pesticide formulation can be toxic to honey bees by impairing their ability to learn. Of the inert ingredients tested, organosilicone surfactants/adjuvants were most toxic. Other non-toxic surfactants showed some toxicity and crop use were least toxic.

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Beneficiaries
and Lessons
Learned:

Transfer of Information to the Growers, Public & Scientific Communities

This information has been incorporated into the *Penn State Tree Fruit Production Guide 2016-17* with changes to the bee toxicity tables and the recommendations for RAA control now recommending the earlier half-inch green stage timing to minimize residues in the nectar and pollen to fruit growers of the Mid-Atlantic region. The only neonicotinoid insecticides currently recommended are the much more bee safe products of Assail and Sivanto. Pesticide impacts on pollinators have also been communicated directly to fruit growers through articles in the monthly on-line **Fruit Times** website by Penn State.

Additionally, the USDA Agronomy Technical Note No. 9, Preventing or Mitigating Potential Negative Impacts of Pesticides on Pollinators Using IPM & Other Conservation Practices

<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=34828.wba> first published in 2013 with Xerces and Biddinger is being updated to reflect new data and pesticides registration. Another Xerces & Biddinger publication **Are Neonicotinoids Killing the Bees** <http://www.xerces.org/neonicotinoids-and-bees/> has been updated by the previous authors to include the many new publications and a better understanding of the impacts various uses of neonicotinoids have on pollinators and how IPM can mitigate their impact. The title of the new publication is: **How Neonicotinoids Can Kill Bees: A Review of the Science Regarding the Role these Insecticides Play in Harming Bees** and it should be released by the end of 2016.

To the scientific community, we have published a peer-reviewed article entitled: Integrated Pest and Pollinator Management: Adding a New Dimension to an Accepted Paradigm. - https://www.researchgate.net/publication/277960363_Integrated_Pest_and_Pollinator_Management

	<p>gement Adding a New Dimension To An Accepted Paradigm which offers modifications to the tried and true IPM paradigm to offer solutions to mitigate pesticide impacts on pollinators rather than calling for blanket bans of pesticides such as the neonicotinoids. Numerous extension presentations of this information have been made directly deliver information to fruit growers through winter meetings such as the Hershey Fruit and Vegetable Convention, the Ontario Fruit and Vegetable Convention and the Illinois Fruit and Vegetable Convention.</p>
Project 9	Identify Potato Varieties for Par-Frying Locations across Pennsylvania
Applicant:	<p>Pennsylvania Co-Operative Potato Growers, INC Roger Springer 3107 North Front Street Suite 100 Harrisburg, PA 17110</p>
Project Summary:	<p>As part of the first year (2013-2014) and second year (2014-2015) of this project we had par fry potato variety field evaluation trials in Pennsylvania and had some preliminary par fry potato variety tests at KPP (Keystone Potato Products, Inc.). Based on the data of two years' evaluations, we have selected several potato varieties that have promising par fry characteristics. The potato varieties that perform well for par fry use were identified, looked at finding optimum fertilizer rates and other agronomic and cultural production parameters to produce high quality par fry potatoes under Pennsylvania growing conditions. The specific objectives of this project in years 2015-2017 were: 1) select three to five potato varieties with the best par-frying quality under Pennsylvania field conditions after two years' field and lab evaluation in 2014 and 2015; 2) evaluate cultural practices such as plant timing, fertilizer rate, and seed spacing to determine the best cultural practices for these three to five Par-fry potato varieties; 3) evaluate these three to five Par-fry potato varieties for susceptibility to diseases that commonly occur in Pennsylvania such as late blight, early blight, common scab and powdery scab and develop disease management strategies for all these Par-fry varieties, and 4) recommend these Par-fry potato varieties and the cultural and disease management information to the Pennsylvania potato industry and all Pennsylvania potato growers.</p>
Project Approach:	<p>The Par-Frying project approach used was to first identify and collect potential potato varieties that could later be field tested under PA growing conditions. The better selections were evaluated in conjunction with the Keystone Potato Products, LLC (KPP) testing laboratory using unique par frying techniques. In this lab, selected varieties potatoes were cleaned, cut into fries, blanched, dried to 92% of original weight, partially fried, chilled, and then stored for final finish par-frying. The potato variety "Easton" was identified as the best variety for par-fry quality.</p> <p>Potato trials were planted at three locations to evaluate potato varieties that might be suited for par-fry potato production. Tubers from the three locations were harvested and evaluated for yield, internal and external tuber quality, tuber size, specific gravity, color, French fry quality,</p>

and French fry color measured at three different intervals of storage. See tables 5, 6, 7 and 8 in: <http://plantpath.psu.edu/research/areas/plant-disease-management/penn-state-potato-research-program/pennsylvania-potato-research-reports/pennsylvania-potato-research-report-2016>

In addition, these cultivars were evaluated for internal and external tuber quality . Defects on the potatoes were visually identified and recorded during the grading process. This information can be found in tables 1, 2, 3, and 4 in the above referenced document. Field evaluation trials were also made to determine resistance levels of powdery scab, early blight and late blight. This information is available in pages 37 through 39 in the above report.

Results of this Par-Fry project was presented to potato growers as several locations:
Annual Summer Potato Field days in late August and Early September (Erie and Lehigh Valley)
Potato Variety Demonstration trial at Ag Progress Days in (August at PSU Research Farm)
Presentation in the Potato Session (late winter Mid-Atlantic Vegetable Conference, Hershey, PA)
Potato Day Presentation at the annual Eastern PA Potato Day, early March, Lehigh County.

After we identified four potato cultivars that seemed to perform well as par fry varieties, we did further testing to evaluate various spacing of seed in the row. You can see the data related to the seed spacing trial in Table 13 on page 29 at: <http://plantpath.psu.edu/research/areas/plant-disease-management/penn-state-potato-research-program/pennsylvania-potato-research-reports/pennsylvania-potato-research-report-2014>

There is a small (laboratory scale size) par-fry line at Keystone Potato Processing, LLC., that we used to evaluate par-fry quality of the potato cultivars. We planned this project with the assumption that KPP would be adding a commercial production line at their plant to begin processing Par-Fry potatoes. The actual construction of this line is currently “on hold”, but the concept continues to remain viable. KPP management indicated that while Par-Fry plans are currently “on the shelf”, they do expect to move forward with a commercial par-fry line in the future.

The information and experience gained through this SCBG par-fry project will be used to assist PA potato growers to select and manage appropriate potato varieties for Par-Fry production in Pennsylvania.

Many Pennsylvania potato growers are familiar with the results of this project. It would be foolish for Pennsylvania potato growers to begin growing par-fry potato varieties before the KPP commercial par-fry line is in place. Since construction of KPP’s par-fry line has not yet commenced, this project has not been able to meet the stated goal that 5% of PA growers with more than 5 acres will be growing Par-Fry varieties. We believe that this project, Par-Frying Pennsylvania Potatoes continues to be a viable project. We expect that PA growers will be begin producing Par-Fry potatoes when KPP moves ahead with the installation of the Par-fry line

<p>Goals and Outcomes Achieved:</p>	<p>Objective 1: The selection of three to five potato varieties with the best par-frying quality under Pennsylvania field conditions after two years’ field and lab evaluations in 2014 and 2015. (Robert Leiby, Roger Springer, PA Co-Op; Mike Peck, Xinshun Qu, Penn State)</p> <p>Activities: We evaluated our best yielding varieties by Par-Frying potato samples that were harvested and stored for several months to simulate actual potato storage conditions. We used Keystone Potato Products (KPP) laboratory to run par fry tests and evaluate the par fry quality.</p> <p>The four potato varieties with best par-frying quality under Pennsylvania field conditions after two years’ field and lab evaluation in 2014 and 2015 were selected. These four varieties are: Easton, Norwis, Ambassador and Performer.</p> <p>Significant results, accomplishments, conclusions and recommendations: The four best performing potato varieties for par-frying were selected from the hundreds of varieties we evaluated during the two years’ field evaluation trials. These four varieties are being recommended to the Pennsylvania potato industry and all Pennsylvania potato growers.</p> <p>Objective 2: Evaluate the cultural practices such as plant timing, fertilizer rate, seed spacing to determine the best cultural practices for these three to five Par-fry potato varieties. (Robert Leiby, Roger Springer, PA Co-Op; Mike Peck, Xinshun Qu, Penn State)</p> <p>Activities: The cultural practice evaluation trials were conducted at the Russell E. Larson Agricultural Research Center at Rock Springs, PA. The four potato varieties selected for par fry were evaluated for fertilizer rate (normal and higher fertilizer rate) and seed spacing (9, 12, 15 inches) in 2016. The experimental design used was a randomized complete block with three replications. The tubers from all the trials were harvested in October 2016. They are being evaluated for tuber conformation, tuber shape, tuber set, depth of eyes, and skin type. The tubers will be: a) graded for yield of US#1, b) evaluated for specific gravity, and c) assessed for internal abnormalities such as internal browning and hollow heart. The results from the fertilizer rate and seed spacing trials are shown in Table 1 and 2.</p> <p>Significant results, accomplishments, conclusions and recommendations: Generally there was no significant yield difference between the two fertilizer rates for all four varieties. There was no significant yield difference among the three seed spacings for Ambassador, Norwis and Performer. There was a significant yield difference among three spacings for Easton. As a result of this study, we now know that Easton produces a higher yield from a 9 inch seed spacing than a 12 or 15 inch seed spacing. The information on fertilizer rate and seed spacing will be provided for the cultural practices to all Pennsylvania potato growers when they grow these par-frying varieties.</p> <p>Objective 3: Evaluated these three to five Par-fry potato varieties for susceptibility to diseases</p>
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that commonly occur in Pennsylvania such as late blight, early blight, common scab, powdery scab and develop disease management strategies for these Par-fry varieties. (Xinshun Qu, Mike Peck, Penn State; Robert Leiby, Roger Springer, PA Co-Op)

Activities:

The four best par-fry potato varieties selected were evaluated for late blight, early blight and common scab trials at the Russell E. Larson Agricultural Center at Rock Springs and powdery scab in Potter County in 2016. The experimental design was a randomized complete block with 3 replications with 5 seed pieces per replicate for all trials. Inoculations were performed for late blight and early blight trials. The disease ratings of late and early blight were determined by visually assessing each plot and estimating the percentage of diseased foliage several times during the epidemic. The area under the disease progress curves were calculated. Common scab trial was conducted in a naturally infested field. At harvest, all the tubers were harvested and scored for common scab lesion types and disease severity. The powdery scab trial was conducted in a naturally infested field in Potter County. The tubers were harvested and the disease incidences were determined. All data is being analyzed.

Significant results, accomplishments, conclusions and recommendations:

The disease resistance/susceptibility of these four varieties to the four common potato diseases (late blight, early blight, common scab and powdery scab) in Pennsylvania was determined based on our disease evaluation trials. Ambassador and Performer are resistant to late blight. Easton is moderately susceptible to late blight. Norwis is susceptible to late blight. Performer and Easton are moderately resistant to early blight. Norwis and Ambassador are moderately susceptible to early blight. Easton is moderately resistant to powdery scab. Performer, Ambassador and Norwis are susceptible to powdery scab. Norwis is moderately resistant to common scab. Performer, Ambassador and Easton are susceptible to common scab. These results will provide Pennsylvania potato growers information on the potential disease problems of these varieties and to be prepared for the disease management when they grow these varieties.

Objective 4: Recommend these Par-fry potato varieties and the cultural and disease management information to the Pennsylvania potato industry and all Pennsylvania potato growers. (Robert Leiby, Roger Springer, PA Co-Op; Mike Peck, Xinshun Qu, Penn State)

Activities:

Based on the data from the three year's project, we have provided information on par fry potato varieties with high yields and the best processing quality to all Pennsylvania potato growers and industry via printed research reports, demonstration trials, meetings, personal contacts and newsletters. The project and findings were discussed at the MidAtlantic Vegetable Conference Potato sessions in 2015, 2016, and 2017. Potato farmers were informed about the study at Lehigh/Northampton and Erie County Potato field Meetings. Par Fry potatoes were discussed at the Eastern PA Potato Day program held in March 2016 and 2017. We have provided the best cultural and disease management information for these par fry potato varieties.

Beneficiaries:	Through this Par-Frying project KPP would be a beneficiary as the purchaser and processor of this new par frying potato product. All Pennsylvania potato growers would benefit. They could grow and be eligible to sell Pennsylvania selected grown par-frying potatoes to KPP as either shareholders of KPP or through the PA Co-operative Potato Growers, Inc.'s marketing channels. KPP has not yet commercialized or integrated this par-frying process. When that does occur, we expect to provide Pennsylvania potato growers with par frying potato varieties and with field management suggestions.																																																																																																	
Lessons Learned:	The four best performing potato varieties for par-frying were introduced and recommended to all Pennsylvania potato growers and industry. Par-fried potato products provide a new opportunity for Pennsylvania Potato Growers. Although KPP has not yet installed a commercial par fry processing line as of this date, this project is still a priority. The information gathered by this project should be useful to the Pennsylvania Potato Community when the project moves forward in the future. Keystone Potato Products, Inc. expects to have the capacity to produce these par-fried potato products to meet market demand.																																																																																																	
Additional Information:	<p>Table 1. Total yield, US#1 Yield (greater than 1 7/8" yield) for four Par-fry varieties with three seed spacings (9", 12" and 15") in Penn State Plant Pathology Farm, Rock Springs, 2016.</p> <table><tr><th rowspan="2">Space</th><th colspan="2">Ambassador</th><th colspan="2">Easton</th><th colspan="2">Norwis</th><th colspan="2">Performer</th></tr><tr><th>Total Yield (cwt/A)</th><th>US#1 Yield (cwt/A)</th><th>Total Yield (cwt/A)</th><th>US#1 Yield (cwt/A)</th><th>Total Yield (cwt/A)</th><th>US#1 Yield (cwt/A)</th><th>Total Yield (cwt/A)</th><th>US#1 Yield (cwt/A)</th></tr><tr><td>9"</td><td>371 a</td><td>247 a</td><td>355 a</td><td>275 a</td><td>218 a</td><td>197 a</td><td>268 a</td><td>178 a</td></tr><tr><td>12"</td><td>347 a</td><td>231 a</td><td>299 b</td><td>231 b</td><td>211 a</td><td>193 a</td><td>231 a</td><td>151 a</td></tr><tr><td>15"</td><td>333 a</td><td>220 a</td><td>245 c</td><td>176 c</td><td>207 a</td><td>187 a</td><td>220 a</td><td>144 a</td></tr><tr><td>LSD</td><td>103</td><td>79</td><td>51</td><td>44</td><td>51</td><td>50</td><td>83</td><td>72</td></tr></table> <p>Means followed by the same letter within columns are not significantly different at $P = 0.05$ as determined by Fisher's protected least significant difference (LSD) test.</p> <p>Table 2. Total yield, greater than 1 7/8" yield for four Par-fry varieties with two fertilizer rates (normal and higher fertilizer rates) in Penn State Plant Pathology Farm, Rock Springs, 2016.</p> <table><tr><th rowspan="2">Fertilizer</th><th colspan="2">Ambassado</th><th colspan="2">Easton</th><th colspan="2">Norwis</th><th colspan="2">Performer</th></tr><tr><th>Total Yield (cwt/A)</th><th>US#1 Yield (cwt/A)</th><th>Total Yield (cwt/A)</th><th>US#1 Yield (cwt/A)</th><th>Total Yield (cwt/A)</th><th>US#1 Yield (cwt/A)</th><th>Total Yield (cwt/A)</th><th>US#1 Yield (cwt/A)</th></tr><tr><td>Higher</td><td>364 a</td><td>235 a</td><td>309 a</td><td>243 a</td><td>225 a</td><td>214 a</td><td>252 a</td><td>169 a</td></tr><tr><td>Normal</td><td>336 a</td><td>231 a</td><td>291 a</td><td>211 a</td><td>199 a</td><td>171 b</td><td>228 a</td><td>146 a</td></tr><tr><td>LSD</td><td>84</td><td>64</td><td>41</td><td>36</td><td>42</td><td>41</td><td>67</td><td>59</td></tr></table> <p>Means followed by the same letter within columns are not significantly different at $P = 0.05$ as determined by Fisher's protected least significant difference (LSD) test.</p> <p>Picture 1. The par fry process requires blanching and drying of the fresh cut fries, before frying. The water temperature is checked before blanching one of the variety sample batches.</p>	Space	Ambassador		Easton		Norwis		Performer		Total Yield (cwt/A)	US#1 Yield (cwt/A)	Total Yield (cwt/A)	US#1 Yield (cwt/A)	Total Yield (cwt/A)	US#1 Yield (cwt/A)	Total Yield (cwt/A)	US#1 Yield (cwt/A)	9"	371 a	247 a	355 a	275 a	218 a	197 a	268 a	178 a	12"	347 a	231 a	299 b	231 b	211 a	193 a	231 a	151 a	15"	333 a	220 a	245 c	176 c	207 a	187 a	220 a	144 a	LSD	103	79	51	44	51	50	83	72	Fertilizer	Ambassado		Easton		Norwis		Performer		Total Yield (cwt/A)	US#1 Yield (cwt/A)	Total Yield (cwt/A)	US#1 Yield (cwt/A)	Total Yield (cwt/A)	US#1 Yield (cwt/A)	Total Yield (cwt/A)	US#1 Yield (cwt/A)	Higher	364 a	235 a	309 a	243 a	225 a	214 a	252 a	169 a	Normal	336 a	231 a	291 a	211 a	199 a	171 b	228 a	146 a	LSD	84	64	41	36	42	41	67	59
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Picture 2. Gwen Ney, Food Safety Manager at KPP weighs out a sample of fresh cut fries before blanching.



Picture 3. After blanching the samples were placed in a food drier to reduce the moisture content by 8% by weight.



Picture 4. Finished French Fries were evaluated for color, taste, and texture.



Picture 5. Mike Peck evaluates Par-Fry potatoes for appearance and quality in the Penn State Potato Quality Lab.



Picture 6. Potato Growers look at the internal quality of Par-Fry Potatoes at the 2016 Erie County Potato Field Meeting.



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Project 10	Using Roller Crimper Technology, Cover Crops, and Insectary Strips to Improve Organic Vegetable Cropping
Applicant:	Rodale Institute Dr. Gladis Zinati 611 Siegfriedale Road Kutztown, PA 19530
Activities Preformed:	On August 23, 2016, sixteen 300 ft ² plots were drilled with a cover crop mixture rye/hairy vetch (R/HV) and another set of 16 plots were drilled with rye. Field peas were drilled in the latter 16 plots in early spring 2017 for a rye/pea (R/P) mix. Cover crop biomass was sampled in each plot

using 9 ft² quadrats on May 23, 2017. The biomass was dried and will be weighed and subsampled for grinding and sent out for chemical analysis. Cover crop plots were either rolled or plowed under between May 18 and June 2nd, 2017. Cucumber ‘Ministro’ seedlings were transplanted into either black plastic using the water wheeler at 18-inch in-row spacing (between plants) or into rolled cover crops using the no-till planter and covered with row covers, a cultural control measure, to ensure seedlings establishment and deter striped cucumber beetles from laying eggs at the seedlings roots under the soil.

The one-year old insectary strips included alfalfa as primary plant species to attract wolf spiders and ground beetles. Early March 2107, the alfalfa was mowed to encourage regrowth followed by planting fava bean and pea seeds by hand. Transplants of holy basil, lemon balm, calendula, bouquet dill, sweet alyssum, and marigold were included into these strips. The prolonged period of cold season during May 2017 delayed flowering of these plants in the insectary strips. The dill and sunflower started to show buds on June 21, 2017 and flowered in early July 2017. Hover flies, bumble bees, honey bees, and lady bugs started to visit the insectary strips on June 15, 2017. These plants flowered as the season progressed allowing continuous sources of nectar and pollen.

After removal of row covers, sticky yellow cards were placed in middle of each of cucumber bed and insectary strip on a weekly basis. The sticky yellow cards were collected 48 hours post placement and assessed for number of cucumber beetles and beneficial insects. Pitfall traps were installed in each bed and along the perimeter of experimental trial. Lids of pitfall traps were opened about an inch from ground surface for 48 hours with the numbers of ground beetles and wolf spiders falling into each trap counted. Five samplings were made during the season. Ground beetles were counted according to species. Soil samples were collected at rolling of cover crops (beginning of the season) and mid-season for physical, chemical and biological assessment.

Cucumber fruits were sampled twice per week starting July 12, 2017. Harvested fruits were sorted into three groups - marketable premium, damaged by beetles, and culls. The youngest mature leaf from each plant per plot (17 leaves) was collected fresh and placed in a paper bag and shipped overnight in a cooler for nutrient analysis at PSU’s Agricultural Analytical Services Laboratory.

The main goal of our project is to enhance the competitiveness of PA specialty crop growers. The objectives of this project are to 1) identify and assess the impact of cover crop residue mulch on weed management compared to tilling the cover crop and using plastic mulch, 2) analyze the impact of each cover crop treatment on nutrient levels in cucumber, 3) assess the impact of native and flowering insectary plant strips on attracting beneficial insects and predators to control pests (mainly striped cucumber beetle), 4) quantify soil health and crop yield and quality, and 5) disseminate information gained from this project to specialty crop growers using educational venues.

Performance measure as listed in the proposal

Goal 1: We will quantify the effectiveness of proposed system (rolling technology, cover crops, insectary strips) against the current system (tillage and plastic mulch) by gathering and analyzing data in each system on amount of weed biomass and insect pest levels; crop yield and quality; and soil quality. **Goal 2:** Through our workshops, surveys and questionnaire: we will quantify number of growers participating in the specialty crop workshops, number of participants who gained knowledge or change their attitude, and number of participants planning to implement management changes. We also will quantify the amount of educational materials developed and disseminated, and the number of organic specialty growers attending presentations at PASA, NOFA-NJ and the Mid-Atlantic Fruit and Vegetable Conferences.

Significant results and accomplishments

- a. *Cover crops:* Mean dry weight of R/HV cover crop biomass averaged 6,273 lb/acre compared to 4,234 lb/acre for R/P. Samples are being analyzed for nutrients at PSU's Agricultural Analytical Services Laboratory.
- b. *Cucumber yield:* Mean total marketable cucumber yield in 2017 was greater in black plastic treatments than in rolled cover crop mulched treatments. Mean marketable cucumber yield was 63,500 lb/acre in R/HV plastic treatment versus 18,900 lb/acre in R/HV mulch, whereas, it was 47,500 lb/acre in R/P plastic versus 7,300 lb/acre in R/P mulch treatment. The integration of insectary strips increased marketable cucumber yield in the R/HV rolled mulch treatment.
- c. *Striped Cucumber beetles, Lady bugs, and minute pirate bugs:*
In 2017, mean number of striped cucumber beetle per trap was reduced in all cucumber beds (0.8/trap) and insectary strips (<0.3/trap). These numbers were much lower than those of 2016. Striped cucumber beetle number peaked on July 29, 2017 and continued to decline after that date. However, mean number of lady bugs and minute pirate bugs was 3-fold greater in 2017 than in 2016. Mean number of lady bug was 0.9/trap in the insectary strip and was 1.25/trap in cucumber beds with or without insectary strips. On the other hand, number of minute pirate bug was highest in the insectary averaging 1.3/trap versus 0.9/trap in cucumber beds with or without insectary strips.
- d. *Ground beetle count and species:*
Mean ground beetle count has increased from 2016 and mostly in two specific species *Chlaenius tricolor* (0.55/trap) and *Scarites subterraneus* (0.25/trap). Ground beetle population was highest in the insectary strips (2.8/trap) than in grass perimeter (1.3/trap). Mean ground beetle count was higher in plastic mulch (3.1/trap) of cucumber beds with insectary than in rolled mulch (2.3/trap). No significant difference in ground beetle count in plastic versus rolled mulch in cucumber beds without insectary.

Recommendations:

Again this year, visual observations on cucumber plants showed no symptomatic bacterial wilt

disease of leaves. That could be contributed to low number of striped cucumber beetles this year and being possibly not infected.

1. Design and test the impact of using cover crop mixtures with additional fertilizer to optimize cucumber production in rolled mulch when compared to plastic mulch. This system is recommended to be tested on other specialty crops at larger scale.
2. Design and test the impact of insectary strips on the control of pests that cause damage on other organic specialty crops such as potato, onion, crucifers and herbs. These tests will provide more information on the potential use of insectary flowering strips as a biological control.

Performance goals achieved

Goal 1: The effectiveness of proposed system (rolling technology, cover crops, insectary strips) against the current system (tillage and plastic mulch) was quantified by gathering and analyzing data in each system on amount of weed pressure and insect pest levels; crop yield and quality; and soil quality.

Goal 2: Workshop presentations were made at two conferences: The Mid-Atlantic Fruit and Vegetable Convention and PASA. The 110 attendees at these two presentations were provided with pre- and post-surveys to quantify number of growers participating in the specialty crop workshops, number of participants who gained knowledge or change their attitude, and number of participants planning to implement management changes. In winter 2018 compiled data from these questionnaires will be analyzed and tabulated. In addition, 308 farmers, researchers, policy makers, extension educators, veterans, students and other interested clienteles, who either visited or became involved in this project, were made aware of the project goals and its progress. The results were also presented to specialty crop professionals at the American Society of Horticultural Science Conference in Hawaii on September 21, 2017.

Two invited articles were published on the results of first project year and two workshops were conducted during winter 2017. One in the Pennsylvania Certified Organic (PCO) trade magazine “Organic Matters” pages 6-7, sent to 10,000 people, **see attached pdf**. The other was in New Farm magazine page 29, distributed to 30,000 including organic farmers in the U.S. (**see attached pdf**).

Four blogs on this project were posted Rodale Institute’s website www.rodaleinstitute.org between February and May 2017. Below find the blog titles and number of page views per blog through October 2017:

Rotational No-Till & Insectary Strips for Organic Cucumber Production (212 page views): February 9th, 2017. <https://rodaleinstitute.org/rotational-no-till-insectary-strips-for-organic-cucumber-production/>

No-Till and Insectary Strips for Organic Cucumber Production (372 page views): April 12, 2017.

<https://rodaleinstitute.org/no-till-and-insectary-strips-for-organic-cucumber-production/>

What do yellow sticky cards tell us about beneficial insects and pests? (205 page views): April 21, 2017. <https://rodaleinstitute.org/what-do-yellow-sticky-cards-tell-us-about-beneficial-insects-and-pests/>

Using Flowers as Natural Pest Control for Organic Vegetable Production (239 page views): May 4th, 2017: <https://rodaleinstitute.org/using-flowers-as-natural-pest-control-for-organic-vegetable-production/>

Information on this project was also disseminated to the public through 10 outreach media posts on Rodale Institute’s Facebook account. Below find the links and number of people reached through October 2017:

<https://www.facebook.com/rodaleinstitute/posts/10154188267152233>

2,225 People Reached

23 Likes, Comments & Share

<https://www.facebook.com/rodaleinstitute/posts/10154361464492233>

2,648 People Reached

19 Likes, Comments & Shares

<https://www.facebook.com/rodaleinstitute/posts/10154875925717233>

387 People Reached

7 Likes, Comments & Shares

<https://www.facebook.com/rodaleinstitute/posts/10154167562132233>

1,324 People Reached

8 Likes, Comments & Shares

<https://www.facebook.com/rodaleinstitute/posts/10154148733197233>

1,735 People Reached

21 Likes, Comments & Shares

<https://www.facebook.com/rodaleinstitute/posts/10154665529807233>

2,542 People Reached

36 Reactions, Comments & Shares

<https://www.facebook.com/rodaleinstitute/posts/10154913833207233>

1,006 People Reached

3 Likes, Comments & Shares

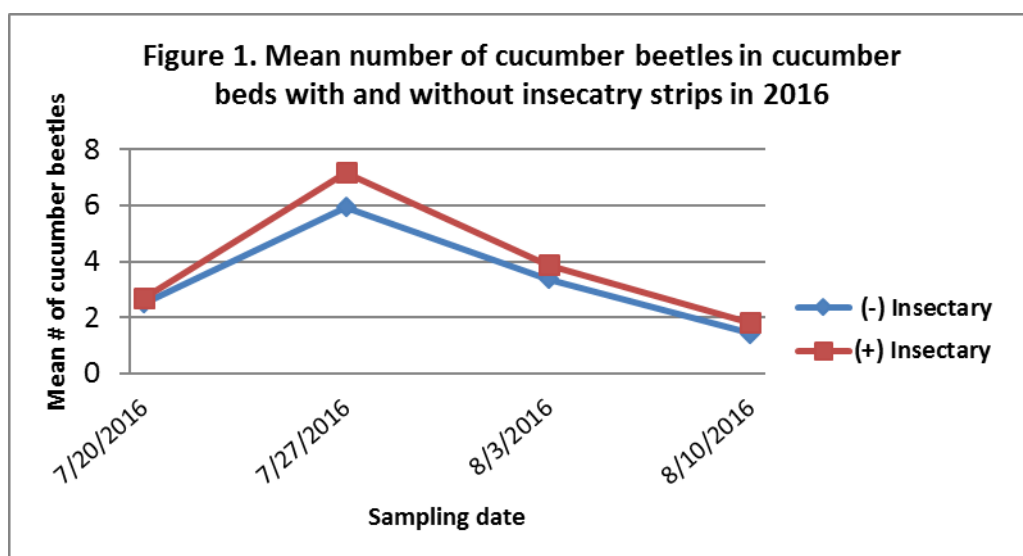
<https://www.facebook.com/rodaleinstitute/photos/pcb.10154894690087233/10154894688897233/?type=3>

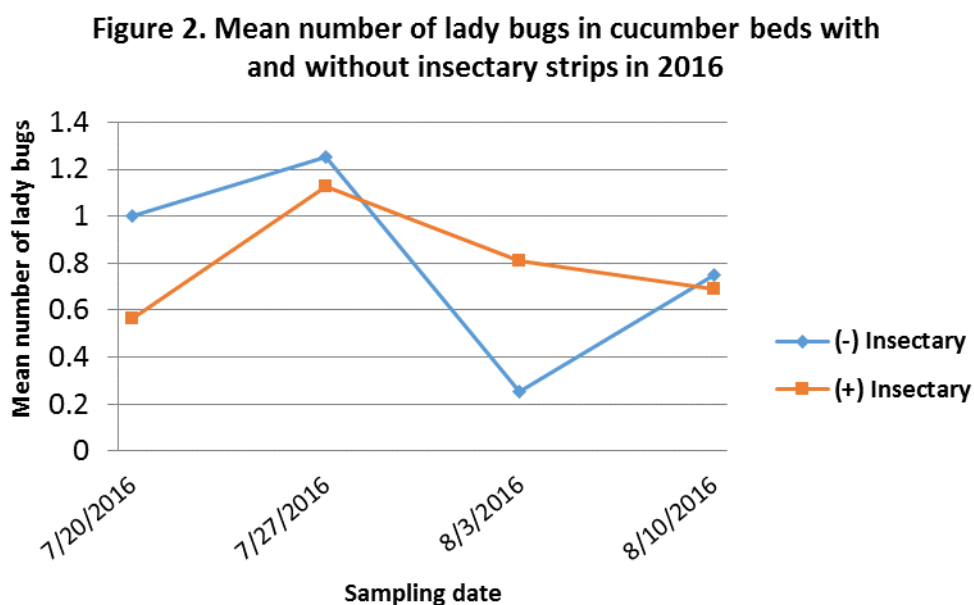
Pennsylvania Department of Agriculture – FY2015 Specialty Crop Block Grant

	<p>3,255 People Reached 33 Reactions, Comments & Shares</p> <p>https://www.facebook.com/rodaleinstitute/photos/pcb.10154589344832233/10154589343107233/?type=3</p> <p>2,096 People Reached 20 Likes, Comments & Shares</p> <p>https://www.facebook.com/rodaleinstitute/photos/a.393429852232.170069.43896827232/10154426486132233/?type=3</p> <p>2,467 People Reached 41 Likes, Comments & Shares</p> <p>Currently, we are working on designing the fact sheet and the field guide to provide specialty growers with information on the benefits of insectary strips to improve their crop production.</p>
Problems and Delays:	The weather was cold this year and did not allow cover crops to grow and produce enough biomass like last year. This caused delay in flowering and reaching 50% blooming of both hairy vetch and field peas.
Future Project Plans:	Between now and next winter season of 2018, we plan to write and post two web articles on Rodale Institute's website, analyze and graph data from soil and leaf samples, compile and analyze responses from surveys conducted at two workshops in 2017, disseminate the compiled information through a fact sheet and a field manual.
Funding Expended to Date:	\$66,889.14
Additional Information:	



Figures 1 and 2





Project 11	Improving the Market Share of Non-Traditional Specialty Crops in PA through Farmer Trainings in Production
Applicant:	Pennsylvania Association for Sustainable Agriculture Helen Kollar-McArthur PO Box 419 Millheim, PA 16854
Project Summary:	<p>The goal of our project was to encourage the sustainable production of non-traditional specialty crops with strong market potential in Pennsylvania, increase farmers’ potential revenue streams, connect producers and distributors to fill current gaps in the Pennsylvania market, and introduce the Pennsylvania consumer to a wider variety of nutritionally dense and flavorful foods. We particularly wanted to highlight what we consider to be “non-traditional” specialty crops as part of this project with high potential for both season extension and potential for high returns at market. As such we choose the following crops to focus on: potatoes, sweet potatoes, winter squash, storage onions, peaches, strawberries, raspberries, blueberries, ginger, goldenseal, lavender, cilantro, basil, marjoram, and thyme.</p> <p>We found that this was an important project to take on, in particular because the 2012 USDA Agricultural Census reported that we are still losing farmers at an alarming rate and PASA’s own surveys indicate that many farms struggle to be profitable. In Pennsylvania, the number of farms decreased by over 6% between 2007 and 2012. This drop disproportionately affected farms with less than 179 acres. The number of harvested acres for peaches, brambles, strawberries, potatoes, and squash also decreased. PASA’s mission, <i>to promote profitable farms that produce healthy food for all people while respecting the natural environment</i>, recognizes</p>

	that the goals of increasing our farms and maintaining our ability to feed the Commonwealth and beyond cannot be achieved without finding methods that allow farms to profit without destroying the natural resources and environment. We felt that producers must be educated on efficient yet ecological growing methods, shown evidence of consumer interest and market potential for high value specialty crops, and trained to access diverse sales streams including the wholesale market. This project trained farmers to grow and sell specialty crops that are poised to make a significant contribution to the financial success of their farming operation. The impacts of this project was tracked through educational event evaluations which found that each event was able to increase the knowledge and practical skill sets of farmers based on the specific topic of the event they attended. Participants also strongly expressed that they would be willing to adopt new skills and practices learned.																			
Project Approach:	Educational events were held in three formats for this project 1) Half day pre-conference sessions at the annual PASA conference 2) 80 minute workshops at the annual PASA conference 3) On-farm field days throughout the state of Pennsylvania. We focused our event agendas on addressing ecological management of pest and disease in specific specialty crops as well as potential market outlets. Where possible wholesale distributors were invited to events to meet with growers to discuss how farmers can enter the wholesale market.																			
Goals and Outcomes Achieved:	<p>Twenty-one educational events were held at the annual PASA conference in addition to four field days; completing all event outreach goals that were proposed for this project. Event pre/post evaluations demonstrate that our desired outcomes of the following were achieved: 1) Reach current and aspiring farmers, and educate them on the potential of key specialty crops. 2) Increase the knowledge and practical skills of farmers specific to sustainable methods of disease and pest management for susceptible specialty crops. 3) Increase the number of farmers producing the crops addressed in this proposal by offering instruction on basic cultivation practices.</p> <p>Our target goal for total number of attendees across all events was 1,000. We surpassed this goal with a total number of attendees of 1,086. Change in knowledge was self reported by attendees and measured on a 4pt. Likert scale. The average change in knowledge was +.98. We consider an increase in knowledge of +.75 to be a significant change. For those who attended conference workshops additional questions were added to their event evaluations which asked their likelihood to adopt a new practice, in regards to agricultural production practice. This was measured on a 4pt. Likert scale and was found to be quite high at 3.27 after attendance at a workshop. During the 2016 conference a question was also asked on the post event evaluation on the likelihood to improve a current method. This averaged 3.62. This particular question was dropped from the conference event evaluation in 2017 as the language was combined with the previous question of likelihood of adopting a new method. A summary of all events can be found in Table 1.</p> <p>Table 1: <i>Summary of all educational events</i></p> <table> <tr> <td>TOTAL/ AVERAGES</td><td>1086</td><td>2.30</td><td>3.29</td><td>0.98</td><td>3.27</td><td></td></tr> <tr> <td></td><td></td><td colspan="2">CHANGE IN KNOWLEDGE</td><td></td><td></td><td></td></tr> </table>						TOTAL/ AVERAGES	1086	2.30	3.29	0.98	3.27				CHANGE IN KNOWLEDGE				
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	Event	# of attendees	Before	After	Change	Likelihood to adopt new method	Likelihood to improve current method
	Growing & Marketing Young Ginger in a Temperate Climate	26	1.67	3.94	2.27	4.22	3.44
	Accessing & Succeeding in Wholesale Fruit & Vegetable Markets	35	3.38	4.23	0.85	3.62	3.54
	Boost Sales with Microgreens, Micro Herbs, Shoots & Table Salads	50	2.18	3.45	1.27	3.82	4.09
	Organic Stone Fruit Integrated Pest Management Methods - That Work!	23	2.92	3.58	0.66	2.83	3.33
	Accessing New & Existing Wholesale Markets for Fruits & Vegetables	24	2.92	3.83	0.91	3.33	3.25
	Developing Sustainable Stone Fruit Production Systems	30	2.60	3.10	0.50	3.20	3.60
	High Tunnel Young Ginger Production in a Temperate Climate	57	1.79	3.95	2.16	3.53	3.53
	Lavender Farming: Planting, Harvesting, Distilling & Propagation	75	1.75	3.89	2.14	4.14	3.82
	Growing Organic Potatoes to Fill the Wholesale Market Gap	54	3.19	4.14	0.95	3.81	4.1
	Optimizing Small Fruit Ecosystems for Biological Control	10	3.00	3.00	0.00	3.33	3.33
	Growing & Handling Onions & Winter Squash for Storage	90	2.97	4.08	1.11	3.51	3.82
	Sustainable Strawberry Stories	20	1.88	2.38	0.5	2.5	
	Native Appalachian Medicinal Forest Plants: Production, Economics, & Markets	53	1.83	2.96	1.13	3.17	
	Native Appalachian Medicinal Forest Plants: Finding a Niche in Forest Herbs	60	1.86	2.76	0.9	2.93	
	Commercial Herb Production from Seed to Shelf	50	1.9	2.75	0.85	3.05	
	Fruit Tree Planting & Establishment	71	2.08	2.96	0.88	3.35	
	Allium Pests & Diseases from Allium Leaf Miner to Rot	65	2.03	3.14	1.11	3.07	
	Growing Sweet Potatoes from Start to Finish	85	1.88	2.81	0.93	2.81	

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	High Tunnel Raspberry Production	43	1.71	2.57	0.86	2.95		
	Success with Blueberries	72	2.06	3.03	0.97	3.19		
	Producing Potatoes for the Wholesale Market	13	2.5	2.75	0.25	2.25		
	Field Day-Organic High Tunnel Raspberry Production	10	1.75	3.36	1.61			
	Field Day-Fruit Tree Grafting and Pruning	17	2.49	2.78	0.29			
	Field Day-Culinary & Medicinal Herb Propagation	35	2.61	2.93	0.32			
	Field Day-Specialty Crops in Focus: Young Ginger Production in the Northeast	18	2.63	3.79	1.16			
Beneficiaries:	This project was specifically targeted to benefit beginning and experienced farmers. A total of 1,086 people were reached. The majority of attendees at event were farmers with a low level of knowledge of the production practices related to the specialty crops addressed with a desire to either improve or incorporate these crops into their farm business. Post event evaluations demonstrated that their knowledge increased as well as their self reported likelihood to make a change or incorporate a new production practice. An additional audience who was found to be in attendance were sustainable agriculture professionals. This audience includes those who professionally serve farmers in an educational or consulting capacity such as extension professionals, independent agricultural consultants or other educators working in the nonprofit sector. Their presence helps ensure that the knowledge gained at the events is further carried through their own work with farmers.							
Lessons Learned:	This project was considered to be very successful in it's reach and impact. The topic areas that seemed to have the most impact were those that focused on novel or niche specialty crops or those particularly susceptible to emerging pest and disease threats, specifically the cultivation of young ginger and storage crops. Large changes in knowledge were found on these topics because attendees entered with very limited knowledge to begin with. We feel that this demonstrates a future need to continue to focus on these particular specialty crops as they hold great market potential for Pennsylvania farmers. On the other hand, potatoes remain a challenging topic as there are very few producers in the state of Pennsylvania and a limited pool of knowledgeable producers to choose from when coordinating speakers or hosts for events. Another area we found to be challenging was tracking the individuals who attended events to try to monitor whether they increased their production or were able to tap into a wholesale contract. Because of the way our annual conference registration is tracked (allowing free choice by attendees to attend any workshop) we were not able to monitor individuals over the life of the grant period. In addition to an inadequate registration tracking system PASA also experienced a major transition in our organizational structure halfway through this grant, wherein we downsized our staff by half. This significant shift in staff resources had a dramatic effect on our priorities and ability to deliver on the individual follow-ups. As a result there are remaining unspent funds in the grant award. While we are disappointed that we were not able to deliver on this aspect of the project we still feel that the overall impact and reach of this							

	project was significant.
Project 12	200 Level Specialty Crop Beginning Farmer Workshops
Applicant:	Pennsylvania Farm Link, INC Darlene Livingston 2301 North Cameron Street Harrisburg, PA 17110
Project Summary:	<p>The “200 Level Specialty Crop Beginning Farmer Workshops” provided beginning specialty crop farmers with business, marketing, financial and technical information vital to establishment of thriving specialty crop farms.</p> <p>Workshops will provided breakouts on available cost share and assistance programs and start up loans and financing options. An attorney from Penn State’s Agricultural Law Resource and Reference Center will tackle the subject of leasing farm land and lease documents. Liability concerns in production and sales of specialty crops was also covered.</p> <p>Beginning farmers had time to have their questions answered and discussed issues with presenters who also served as the business contacts for farmers. Specialty crop farmers left the events with questions answered and connected to resources. The information and resources provided long term benefit for the farmers.</p> <p>Farmer panels consisted of successful specialty crop producers explained their general operation and marketing techniques and share successes and challenges of their farm operations. Beginning specialty crop farmers were able to ask questions and receive valuable information from experienced specialty crop producers.</p> <p>At the end of the workshop beginning specialty crop farmers had created new links to available resources. They had printed technical information regarding proper lease documents, liability information, business and marketing tools, and a wealth of knowledge from seasoned specialty crop producers.</p> <p>The success of the program was measured through evaluations.</p>
Project Approach:	<p>Briefly summarize activities and tasks performed during the entire grant period. Whenever possible, describe the work accomplished in both quantitative and qualitative terms. Specifically, discuss the tasks provided in the Work Plan of the approved project proposal. Include the significant results, accomplishments, conclusions and recommendations. Include favorable or unusual developments.</p> <p>If the overall scope of the project benefitted commodities other than specialty crops, indicate how project staff ensured that funds were used to solely enhance the competitiveness of specialty crops.</p>

Pennsylvania Department of Agriculture – FY2015 Specialty Crop Block Grant

	Present the significant contributions and role of project partners in the project.
Goals and Outcomes Achieved:	<p>62 beginning specialty crop farmers participated in 4 workshops and evaluations provided the following outcomes. 49 participants reported they learned a business planning and/or marketing resource they would utilize in their farm business. Thus 80% of participants learned information they would use in their farm business which is 20% higher than anticipated. 44 participants reported they learned of a cost share and assistance programs available and they planned to utilize the opportunity(s). This is right on the mark of 70% of participants. One neat story is of a couple who attended the Greensburg workshop and said they never realized there was a loan program that would assist them in purchasing a walkin cooler to help hold their crop when they pick various vegetables, etc. They were ready to apply for the FSA storage loan when they left the workshop!</p> <p>Of the 62 beginning specialty crop producers 40 reviewed their lease needs and 29 completed lease documents. The number of beginning farmers was a bit lower than originally anticipated however a higher percentage of farmers in the western portion of the state own their land and that was a factor that wasn't taken into consideration initially when planning the project. A lawyer shared liability information with the audience of 62 beginning specialty crop farmers and 85% or 52 producers identified a liability issue they planned to address in order to eliminate on their farm. The results were 10% higher than anticipated!</p> <p>100% of the 62 beginning specialty crop farmers gained knowledge of a practice or idea that they planned to adopt for their farm business and 51 implemented at least one of the items on their farm. The results show the success of the project as this number is 20% higher than projected!</p>
Beneficiaries:	<p>The beneficiaries were beginning specialty crop farmers who were hard workers but possibly not extremely well versed in all the available resources, business and marketing planning, cost share and loan programs, legal aspects of leasing and what to include in a solid ag lease as well as liability issues to consider in all aspects of farming. Specialty crop farmers were highly appreciative of the new found knowledge and put it to use right away.</p> <p>62 participants attended the specialty crop beginning farmer workshops which were carried out across Pennsylvania. It's hard to estimate the potential economic impact when you consider knowledge gained that will be utilized to properly protect specialty crop farmers from potential liability issues and assist them with properly documented leases the economic impact is short term as well as long term. Along with are those participants who were able to advance their farm business faster than anticipated due to new found micro-loan and storage loan information along with cost share program to at least assist with part of the investment of projects that move farm operations forward.</p>
Lessons Learned:	<p>Many times it is hard to get specialty crop beginning farmers to events. They are very busy people who have a huge amount of work to do in order to be successful. Therefore the project team found a need to provide two extra workshops in order to ensure dates fit as many people as possible. This was possible through an increased in-kind funds of PA Farm Link as well as participating speakers who provided their time without charge.</p> <p>The extra work was definitely worthwhile as beginning specialty crop farmers were assisted in</p>

	mission of growing healthy vegetables and fruits. It was also great to see the teamwork of representatives from various organizations and businesses who came together to put on the workshops.
Project 13	Pennsylvania Vegetable Industry Promotion
Applicant:	Pennsylvania Vegetable Marketing and Research Program William Troxell 2301 North Cameron Street Harrisburg, PA 17110
Project Summary:	The purpose of this project by the Pennsylvania Vegetable Marketing and Research Program, a statewide marketing order for vegetable growers, was to further the promotion of Pennsylvania vegetables. The project involved creating two major vegetable displays at the 100 th Pennsylvania State Farm Show in January 2016. One was an enhanced fresh vegetable display in partnership with the Pennsylvania Vegetable Growers Association which annually erects this fresh display. This display incorporated educational components not usually included. The second display was a high tunnel exhibit featuring a full scale high tunnel with living crops. Brochures and other educational materials were produced to distribute at the display. The project budget allowed for the staffing of the high tunnel display with knowledgeable farmers to provide opportunity for personal consumer education. The goal was to showcase the Pennsylvania vegetable industry at this historic edition of the Farm Show more extensively than it has ever been before and thus raise the awareness of the state's vegetable industry among the 500,000 Farm Show visitors. By raising the awareness of the vegetable industry, the ultimate goal was to increase the sales of local, Pennsylvania vegetables during the growing season.
Project Approach:	<p>The fresh vegetable display at the Farm Show has usually consisted of a massive display of fresh vegetables representing the vegetable crops grown in Pennsylvania. Often the display was built around an antique vehicle or piece of farm machinery or a farm market scene. For this historic Farm Show, photographer Roberta Bogash traveled to various farms, markets and processors across the state to photograph glimpses of the Pennsylvania vegetable industry in 2015. Ms. Bogash then created a series of photo posters that were displayed on painted plywood panels at eye level for easy viewing. The fresh vegetables were displayed around the base of the photograph panels.</p> <p>The second display involved erecting a full-scale high tunnel that was 17' wide and 36' long (courtesy of an SCRI berry high tunnel production project being conducted at Penn State University. Live crops, some at full or near full maturity and others at immature stages, were displayed in the high tunnel to represent crops that might actually be produced in a Pennsylvania high tunnel during January, as well as an eye catching summer crop display with tomatoes, eggplant and peppers. Interpretive signage was created to provide consumers with information on high tunnel production techniques being used by Pennsylvania growers.</p>

	<p>Two new professionally designed brochures were created to provide take-home information for the visitors to the high tunnel exhibit:</p> <ul style="list-style-type: none"> • High Tunnels - this included a description of and benefits of growing in high tunnels, the advantages of beneficial insects, and a crop list. • Pennsylvania Vegetables - this included key benefits to buying from your local farmer, a push to the website directory of markets, CSA's, roadside stands, interesting facts about PA Vegetable growing and expert advice about recommended average consumption of vegetables. <p>Also four take home recipe cards were prepared for the visitors using vegetables grown in PA.</p> <p>Adding considerable value to the attendees was the presence of a grower or other knowledgeable person staffed the high tunnel display to engage with visitor and answer questions. Questions ranged from small farm production methods, pest control, cultivation, seed starting, troubleshooting, where to find Pa Vegetables in their region/area and discussions preparation techniques.</p>
Goals and Outcomes Achieved:	<p>1. GOAL: Increased awareness and knowledge about the Pennsylvania vegetable industry by Farm Show visitors. PERFORMANCE MEASURE: Number of persons who ask the staff "interpreters" at the displays substantive questions about the display or industry. BENCHMARK: Assuming the staff "interpreters" at the displays are able to give an answer to the visitor's question, it will be assumed that the visitor's awareness and/or knowledge about the industry has been increased. TARGET: Satisfactory responses to six visitor questions per hour of each staff "interpreters" time on duty. PERFORMANCE MONITORING PLAN: Staff "interpreters" will be asked to keep track of the number of substantive questions they answer.</p> <p>The high tunnel displays at the 2016 Farm Show resulted in achieving and exceeding expected outcomes predicted by the Project Team as Farm Show attendee interest was very high, and consistent throughout the week. Staff tracked up to 50 visitor impressions per hour, which exceeded the projected target of 6 impressions per hour. This figure was determined through staff logging visitors who participated in the high tunnel activity, asked questions about farming/high tunnel growing/PA vegetable crops and general interest in the display.</p> <p>2. GOAL: Increased awareness and knowledge about the Pennsylvania vegetable industry by Farm Show visitors. PERFORMANCE MEASURE: Number of persons who access a website address on the brochures distributed at the Farm Show displays. This will be a particular page on the www.paveggies.org website designed specifically to provide further information to persons who have received the brochure, perhaps something like www.paveggies.org/farmshowbrochure. BENCHMARK: Since this specific page will be mentioned in the brochure, it will be assumed that persons accessing the www.paveggies.org site through this page will have read the brochure in some depth, that they will have some level of interest in Pennsylvania</p>

	<p>vegetables to have taken the initiative to have accessed the website and that they will gain some further awareness and/or knowledge from the brochure and/or their visit to the website.</p> <p>TARGET: At least 100 visits to this entry page on the website during period of January 9 to 23, 2016 (the week of the Farm Show and the following week).</p> <p>PERFORMANCE MONITORING PLAN: Review of website statistics.</p> <p>Furthermore, after a review of website statistics, 120 visits were made to www.paveggies.org during the period of January 9-23rd, 2016. These outcomes assisted the Project Team in achieving the overarching goal of increasing awareness and knowledge about the Pennsylvania vegetable industry for Farm Show visitors.</p> <p>Additionally, more than 5000 newly designed brochures outlining high tunnel production, PA vegetable crop availability, and four recipe cards were distributed.</p>
Beneficiaries:	<p>Primary beneficiaries include Pennsylvania’s vegetable growers who grow over 35 different vegetable crops on a commercial level. Thus developing a substantial, attractive, and eye-catching exhibit highlighting specialty crop production methods and practices are important to remind consumers that Pennsylvania does have a viable vegetable industry that provides significant volumes of fresh local produce during the state’s growing season. According to the Ag Census there are in excess of 3,500 growers of vegetables at some commercial level in Pennsylvania. These growers’ products are available to consumers at roadside farm markets, community farmers’ markets, Community Supported Agriculture (CSA) operations, supermarkets, and restaurants. Reminding consumers that local vegetables are available to them in season will hopefully encourage them to look for and purchase more local vegetables. Given the number of growers involved, the number of marketing outlets that each of the growers uses and inaccessibility of their sales records plus the time lapse between the Farm Show and the local vegetable season, it is not reasonable to estimate the potential economic impact.</p> <p>Secondary beneficiaries would be consumers although in a sense, they are ones who experienced the most personal benefit. About 500,000 persons usually attend the Pennsylvania State Farm Show. Highlighting the year round availability of fresh local vegetables will influence encourage them to purchase more of them and thus increase the quality and nutrition of their diets. By connecting directly with consumers, the project is educating and inspiring attendees to seek out farmers local to their area, and reinforcing seasonal calendars that generate enthusiasm and influence buying patterns. Thousands of Farm Show visitors actually walked through the high tunnel display and engaged with the interpreters while many more at least viewed it walking by.</p>
Lessons Learned:	<p>Although designated staff at the Pennsylvania Farm Show 2016 tallied the number of consumers interested in the display, the Program could further qualitatively investigate the areas of knowledge or topic of concern regarding each question. Recording and analyzing these areas of interest could help the program assess consumer educational needs for future displays and materials. The Program also learned that new creative components could be incorporated into the exhibit to attract more visitors. Lastly, the Program learned the brochures did not drive</p>

as many expected visitors to the website as hoped.

To improve this, the Program intends to design a creative, incentive based activity that will send a higher level of consumers to social media accounts associated with the program. The Project Team believes consumers are kept engaged through social media more using constant contact more than visiting a personal website page. By liking the Facebook page, consumers will receive continuous virtual updates from the Project Team that will maintain awareness beyond the scope of this grant.

Additional
Information:

**ADDITIONAL INFORMATION:
Fresh Vegetable and Vegetable Industry Photograph Display**



High Tunnel Display















Vegetable Brochure

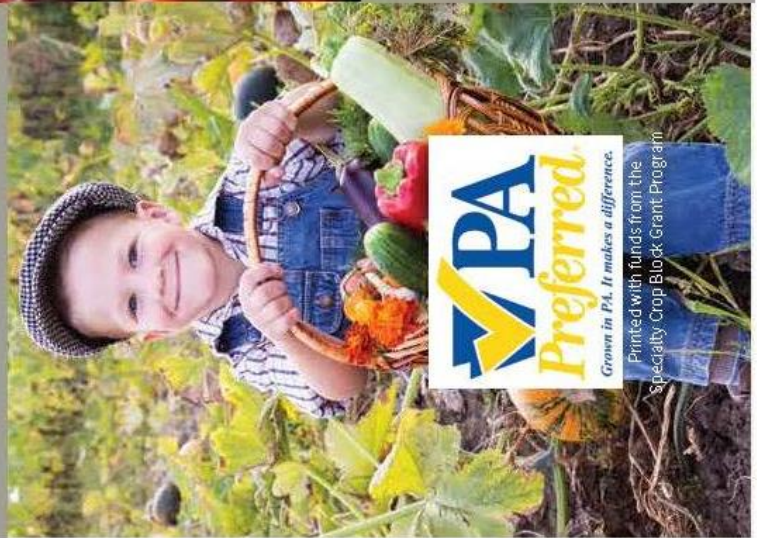
Over 3,400 hard-working Pennsylvania growers raise more than 30 different vegetable crops on more than 60,000 acres of farmland, plus thousands of square feet of greenhouse space.

- Two-thirds of PA vegetables are sold fresh in season at community farmers' markets and roadside farm markets across the Commonwealth as well as at your local supermarket

- Some Pennsylvania vegetables find their way to your favorite local restaurant

- The remaining third of PA vegetables are canned, frozen or dried for your enjoyment year-round

- All Pennsylvania vegetables are "Simply Delicious" and "Simply Nutritious", offering farm-fresh taste, an abundance of variety, and essential nutrition



Printed with funds from the Specialty Crop Block Grant Program

Health experts recommend that the average American should:

- Choose a variety of vegetables every day to get a good mix of vitamins and minerals
- Eat between 2 and 2½ cups of vegetables every day
- Strive to eat the following amounts of vegetables from each of the five groups of vegetables each week:

Dark green - 3 cups
broccoli, dark green leaf lettuce, kale, spinach, turnip greens

Orange - 2 cups
carrots, acorn squash, butternut squash, pumpkin, sweet potato

Legumes - 3 cups
dried beans and peas

Starchy vegetables - 3 to 6 cups
corn, green peas, lima beans, potatoes

Other vegetables - 6 to 7 cups
asparagus, beets, brussel sprouts, cabbage, cauliflower, celery, cucumbers, eggplant, green beans, peppers, lettuce, onions, tomatoes



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VEGETABLES

Your Key to Good Nutrition

www.paveggies.org





THE BENEFITS OF BUYING FROM YOUR LOCAL FARMER



EAT YOUR VEGGIES!

Eating vegetables provides health benefits – people who eat more vegetables and fruits as part of an overall healthy diet are likely to have a reduced risk of some chronic diseases. Vegetables provide nutrients vital for health and maintenance of your body.

Visitors to our website can find acres of information, such as a directory of roadside farm markets (RFM), community farmers' markets (CFM) and community supported agriculture operations (CSA) operated by Pennsylvania vegetable growers. Additionally, information for growers and nutritional information on specific vegetables can be found, as well as research reports and delicious recipes.

Shopping at a community farmer's market is an enjoyable way to buy fresh, local "PA Preferred" vegetables from a variety of local growers. Most farmers' markets are open at least one day a week, while some offer several shopping days a week. Here, the farmers bring their fresh farm products to your neighborhood allowing you to purchase your food directly from the farmer who produced it.



- *Ultra-fresh, locally grown produce*
- *Learn about new vegetables and fruits*
- *Gain an understanding of the seasons and what grows in your area*
- *Relationship with the farmers*
- *Renewable & sustainable*
- *Learn cooking tips, recipes and meal ideas*
- *Discover the spice of life: Variety*
- *Saves you time & money*
- *Connect with your community*
- *Guaranteed local eating*

Why shop at farmers markets, roadside farm markets or join a CSA?

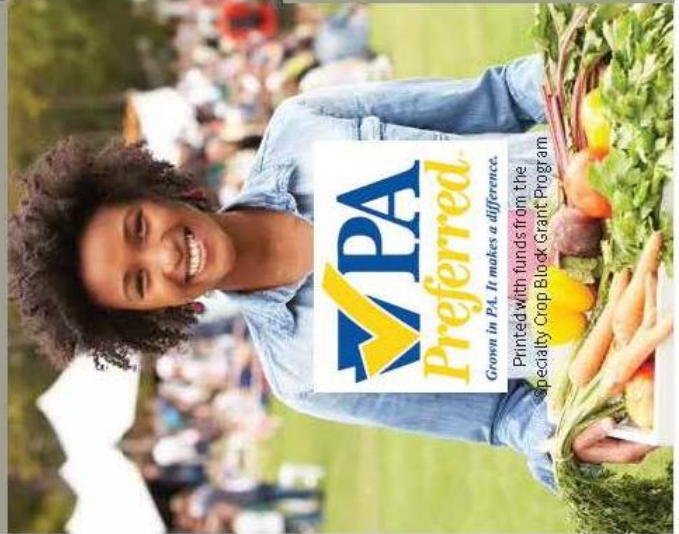
Access to fresh, locally grown foods may be one of the best reasons, but there are many more. All the above options have fruits and vegetables at the peak of the growing season. This means produce is at its freshest and tastes the best. The food is typically grown near where you live, not thousands of miles away or another country. Shopping at these locations also supports your local farmers and keeps the money you spend on food closer to your neighborhood.

The number of farmers markets in the U.S. continues to rise, along with their collective impact on communities across America. Markets have become integral parts of regional food systems, economies, and social networks. Markets offer a place to connect with neighbors, meet local farmers, support local small businesses, and provide nutritious food to neighborhoods in need.

High Tunnel Brochure

{ WHAT ARE HIGH TUNNELS? }

- High tunnels are solar “greenhouses” vegetable and fruit farmers use to extend their growing season.
- High Tunnels, otherwise known as HoopHouses, use passive solar energy to warm the air and the soil inside the tunnel to create ideal conditions for growing vegetables, even when it is freezing outside.
- Thanks to High Tunnels, Pennsylvania consumers can enjoy vine-ripened tomatoes in May and fresh raspberries in November.
- High tunnels are a simple, relatively inexpensive and effective way to protect high-value crops from low temperatures, wind, rain, some insect and foliar disease pests, as well as wildlife damage.



Crops grown in High Tunnels by season, as well as perennials.

Spring

lettuce
tomatoes
strawberries
peas
spring onions
broccoli
radishes
kale
cucumbers
spinach
leeks

Summer

tomatoes
summer squash
strawberries
peppers
onions
broccoli
cucumbers
ginger
basil
eggplant
raspberries
blueberries
blackberries

Fall

lettuce
spinach
collard's
peppers
chard
sweet potatoes
carrots
kale
arugula
raspberries
blackberries

Winter

lettuce
spinach
kale
chard
turnips
sweet potatoes
carrots
arugula



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Your Key to Good Nutrition

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HIGH TUNNELS



THE BENEFITS OF HIGH TUNNELS



- Farmers who grow crops in high tunnels report that they use fewer pesticides, fungicides and fertilizers, and have a quick payback on their capital investment
- High tunnels can have up to three or more cropping cycles per year. This varies by specific crop, but means that a farmer can harvest more crops in a year in a high tunnel than in he could if he were planting in open field
- High Tunnels provide crops protection from weather extremes like frost, high wind, and excessive rainfall or drought. High tunnels also protect crops from deer, birds, and other wildlife
- High tunnels are designed with sides that roll up and roof vents to let the hot air to escape. In hot weather, the sides are rolled up to allow breezes in and vents are opened to allow hot air to escape. In winter months, the sides and vents of the high tunnel can be lowered to keep warm air inside.

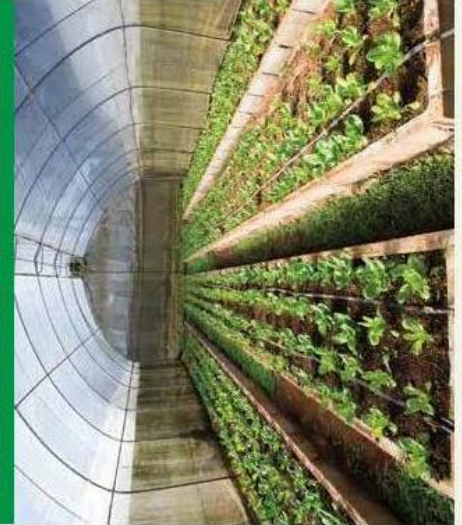
- **Extended growing season**
- **Protection from weather and pests**
- **Perfect for starting seeds**
- **Ideal for growing alternative crops**
- **Low cost**
- **More spacious than cold frames and polytunnels**
- **Irrigation control**
- **Easy to relocate**



BENEFICIAL INSECTS

- Beneficial insects are also used to control pests and diseases that attack fruits and vegetables.
- Common insects like ladybugs and praying mantises are a great friend to the farmers.
- Really cool insects like parasitic wasps actually lay their eggs in destructive caterpillars and the larvae feed on their host when their eggs hatch



Project 14	Getting the Word Out about PA Wine Land- Promoting PA Wines and the Agritourism Experience
Applicant:	The Pennsylvania Wine Association Jennifer Eckinger 411 Walnut Street Harrisburg, PA 17101
Project Summary:	The Association created new and “shareable” content, recruited influential wine, food, and/or travel writers from in and around the Mid-Atlantic region to document two-day tours of PA wine regions. The PA Wines marketing team cultivated content by targeting mainstream press and influential followers to share the content with larger consumer audiences to generate visitor inquiries and sales. The promotion used a combination of web media, social media, blogs, email marketing, text message promotions, as well as partnership marketing with local tourism agencies and Agri-Tourism partners at the Department of Agriculture/PA Preferred.
Project Approach:	<p>The PWA worked directly with SWELL, a marketing firm, to arrange, organize the visits of the writers, the creation of the content and the promotion of the content. SWELL worked with Town Dish.com to execute the creation of the original content, recipes and photos. Activities and promotions related to the CROP Grant began in May 2016 and will continue into December 2016. In May we began with the promotion of National Wine Day and had feature in the TheBurg magazine, highlighting the Susquehanna River Valley winery/agri-tourism coverage. Additionally, Town Dish crafted original content on a PA Wines-inspired BBQ and Picnic Recipes. This original content, which featured PA wines and locally sourced ingredients, was promoted on Pennsylvaniawine.com and via our social media outlets from May through July.</p> <p>From August through October, TABLE Magazine (Pittsburgh) featured the Lake Erie Wine Country wineries/agri-tourism coverage and the PWA promoted the coverage. From August to September 2016, TownDish.com featured content on the PA Wilds wineries/agri-tourism coverage and Northeast Pennsylvania wineries/agri-tourism coverage. The PWA promoted the coverage during that same time to draw attention to the content and encourage visits. Beginning in October 2016, DrinkPhilly.com featured coverage on Lehigh Valley wineries/agri-tourism from a visit the blogger made earlier in 2016.</p> <p>Town Dish also executed the photographs and content related the “Meet the Winemaker” campaign released in October 2016. Planning and preparation of the materials took place in September 2016. The PWA promote the PA Wine Month “Meet the Winemaker” promotions in partnership with PLCB and PA Preferred .</p> <p>Lastly, Town Dish created PA Wines-inspired Fall recipes and content along with PA Wines and inspired Holiday recipes that were promoted from October 2016 to December 2016.</p>
Goals and Outcomes Achieved:	The goal of the project was to increase emerging Millennial consumer interest and visitation with PA wines and related Agri-tourism content marketing. The PWA sought out writers/ bloggers and mediums that reach the target audience to feature PA wines. The PWA also worked with SWELL and Town Dish to create content that featured PA wines and timely information for the season with targeted images.

	<p>The reach and engagement with PA Wines consumers and influencers was achieved by using a combination of third party channels, social media advertising (Facebook, Twitter, and Instagram), email marketing, and public relations.</p> <p>Following are the results of the efforts of the project:</p> <ul style="list-style-type: none"> • Reached 162,000 potential PA wines customers and winery visitors as measured by digital marketing analytics, exceeding weekly reach goals by 165%. • Generated 37,000 individual engagements in the form of content views and shares across web and social media environments, achieving an average cost-per engagement of \$0.81 based on the total \$30,000 total budget spend. This amount is up from the bench mark of an average reach of 250 weekly engagements from (March- November of 2014). <ul style="list-style-type: none"> ○ Total engagements exceeded the goal by 440%. ○ Total new likes followers fell short of the 5,000 new fans/followers, but still increased by slightly more than 2,300 fans and followers. However, changes in social media advertising metrics are creating new and informative ways of understanding reach and engagement. Overall, the reach and engagement metrics exceeded goals and equaled a more efficient campaign. • Contributed a 17% increase (+2,067 visitors per month) in PA wines website visits during the course of the promotional period compared to 2015. <ul style="list-style-type: none"> ○ While the overall average increase during the promotional period fell short of goal by 4.6%, website visits were up significantly 27% during the heaviest promotional period (Jul – Aug). • Contributed 122 individual media coverage hits during the promotional period including original content developed through the program and shares of that content, exceeding our goal of 80 earned media placements. • Based on available sales transactions reporting from 18 wineries through August 2016, the campaign is on target is to contribute a 7% increase or approximately 35,000 visitors to PA wineries statewide during the promotional period, exceeding our goal of 10,000 visitors.
<p>Beneficiaries:</p>	<p>The specialty crop beneficiaries were the more than 220 Pennsylvania Wineries, wine grape growers, producers, and distributors. With nearly 14,000 grape bearing acres in Pennsylvania, this project showcased the locally grown grapes at wineries throughout the Commonwealth. Consumers also benefited from having an increased awareness and perceived accessibility to</p>

	the local wines produced in Pennsylvania. Additionally, Pennsylvania Agri-tourism attractions and programs including farmer's markets, farm-to-table restaurants, and related retailers through the PA Preferred program also benefited from the exposure alongside the wineries.
Lessons Learned:	<p>The PWA was pleased by the increased traffic to the website and social media channels. In scheduling visits for writers to travel to regions of the state, we learned to be mindful of editorial calendars. For the future when working with writers/ bloggers we will take this into consideration.</p> <p>The PWA was pleased with the coverage in the metropolitan markets of Pittsburgh and Philadelphia. The extent of the coverage for the several publications was greater than initially anticipated.</p>
Project 15	Enhanced Preparedness against Major Pathogens that Threaten Crop Production and Markets
Applicant:	<p>Penn State University Seogchan Kang Department of Plant Pathology and Environmental Microbiology University Park, PA 16802</p>
Project Summary:	<p>Pennsylvania's specialty crop growers and industries face with diverse pathogens that can significantly reduce crop yields, quality, and marketability. Introduction of novel exotic pathogens via increasing globalized agricultural trade and production systems not only cause direct crop loss and increased costs for plant management but also incur additional cost by requiring regulatory actions and disrupting trade. Historically, several exotic pathogens have threatened the production and marketability of specialty crops in Pennsylvania. This one year project (Jan. 1, 2016 - Dec. 31, 2016) builds on a long-term partnership between Penn State and PDA and aims to enhance state's preparedness and response against specialty crop pathogens with the focus on <i>Phytophthora</i>. Three specific objectives are: a) characterize the spatial and temporal diversity of <i>Phytophthora</i> isolates associated with various specialty crops; b) understand the ecology and diversity of <i>Phytophthora</i> species captured via stream baiting to help better manage <i>P. ramorum</i>; and c) develop and optimize pathogen diagnostic tools and protocols. Main outcomes/products include: a) enhanced reference data sets support the rapid and accurate identification and detection of <i>Phytophthora</i> pathogens; and b) improved understanding of the spatial and temporal diversity and variation of <i>Phytophthora</i> associated with specialty crops around PA helps preparedness against emerging pathogens.</p>
Project Approach:	<p>1. Reporting period January 1, 2016 – December 31, 2016</p> <p>2. List of All personnel Associated with the Project and Their Roles: Dr. Seogchan Kang, PI and Professor of Plant Pathology at Penn State, coordinated the project and prepared the report Dr. Ekaterina Nikolaeva, Plant Pathologist at PDA, performed <i>Phytophthora</i> molecular diagnostic assays and prepared genomic DNA from <i>Phytophthora</i> isolates stored at PDA. Dr. Seong H. Kim, Plant Pathologist Supervisor at PDA, coordinated sample processing, helped data management and supported report preparation.</p>

	<p>Dr. Jung-Eun Kim, Penn State Postdoctoral Fellow, contributed to identifying <i>Phytophthora</i> isolates via sequencing of their ITS (Internal Transcribed Spacer) regions of ribosomal RNA encoding genes.</p> <p>Lucie Loftus, summer wage-payroll assistant, worked with E. Nikolaeva and J. Kim in preparing pathogen cultures for preservation, genomic DNA extraction, and sequence-based identification of <i>Phytophthora</i>.</p> <p>Peter Lynch, summer wage-payroll assistant, worked with E. Nikolaeva and J. Kim in preparing pathogen cultures for preservation, genomic DNA extraction, and sequence-based identification of <i>Phytophthora</i>.</p> <p>3. Activities and Tasks Performed: The tasks that have been performed and key discoveries/products are described below:</p>
<p>Goals and Outcomes Achieved:</p>	<p>1. Sequence-based characterization of <i>Phytophthora</i> isolates from clinical and environmental samples</p> <p>To help protect specialty crop production and markets from <i>Phytophthora</i> pathogens via a better understanding of their diversity and spatial distribution over time, we have characterized a large collection of <i>Phytophthora</i> pathogens isolated from various specialty crops, nurseries and surrounding environments for many years. Because morphological and cultural traits of <i>Phytophthora</i> often do not provide adequate resolution needed to differentiate closely related species, and generation of such data requires a significant amount of time and experience, gene sequences have been increasingly used for quick strain identification. During this period, we focused on characterizing three groups of <i>Phytophthora</i> isolates: a) isolates cultured from Christmas tree seedlings and intermediate-size trees displaying root rot symptoms submitted to PDA over the last 28 years; b) confirmation of <i>P. chrysanthemi</i> as the causal agent of chrysanthemum root rot in PA and the United States; and c) isolates cultured from streams and soils in and around nurseries affected by <i>P. ramorum</i> since 2010. Tentative species identity of <i>Phytophthora</i> isolates was first determined by sequencing the ITS (Internal Transcribed Spacer) regions of ribosomal RNA encoding genes. This analysis indicated that some of the isolates belong to species complexes that have not been well resolved, requiring sequences from additional loci to accurately identify species. We sequenced a mitochondrial locus for some isolates to better resolve species identity. Manuscripts describing the data derived from Christmas trees and chrysanthemum (summarized below) are being prepared. Sequencing of the <i>Phytophthora</i> isolates (~1,000) captured via stream baiting around PA, as well as nursery inspections, was completed, and data analysis is in progress. Manually curated sequence data will be deposited to <i>Phytophthora</i> Database (www.Phytophthoradb.org).</p> <p>1.1. Diversity and spatial distribution of <i>Phytophthora</i> species associated with Christmas trees (<i>Abies</i> spp.) in Pennsylvania: The Pennsylvania Christmas tree industry has been ranked within the top four in the United States and includes >1,000 farms generating more than \$22 million in annual sales. Christmas tree root rot caused by <i>Phytophthora</i> species is accountable for heavy losses in seedling beds and plantations in PA. During their inspection and certification services, PDA Plant inspectors have brought Christmas tree seedlings and intermediate-size trees that display root rot symptoms to the PDA Plant Diagnostic Laboratory (PDAPDL). Among 290</p>

samples of *Abies* species submitted from 1988 till 2013, 225 samples were diagnosed as *Phytophthora* root rot. *Phytophthora* was recovered from the 225 samples, resulting in 214 isolates in total. Among the *Abies* species analyzed (Table 1), *A. fraseri* was the most frequently infected by *Phytophthora* with 75.7 % of 214 isolates having been cultured from this species, and *A. concolor* and *A. balsamea* were the next most commonly infected hosts, resulting in 8.4 % and 5.1 % of the isolates, respectively. Both the ITS region and the mitochondrial *nad9* locus of most isolates were sequenced to determine species identity. The most frequently isolated species (59.3 % of total isolates) was *P. sp. kelmania*, which was found in all *Abies* spp. except *A. procera* (Table 1). *P. cactorum* (14.9 %), *P. cinnamomi* (7.0 %) and *P. sansomeana* (6.5 %) were next most abundant species, while *P. chlamydospora*, *P. europaea* and *P. colocasiae* were detected only once during this period. Given that 75.7 % of the isolates were isolated from *A. fraseri*, it is not too surprising to see the greatest diversity of *Phytophthora* among the isolates from *A. fraseri* (with *P. sp. kelmania* being the dominant species).

Table 1. Occurrence of *Phytophthora* among *Abies* spp. that displayed root rot symptoms (1988-2013)

Species	<i>A. balsamea</i>	<i>A. concolor</i>	<i>A. fraseri</i>	<i>A. grandis</i>	<i>A. intermedia</i>	<i>A. koreana</i>	<i>A. procera</i>	<i>A. spp.</i>	T
<i>cactorum</i>	3	-	27	-	-	-	2	-	
<i>ambivora</i>	-	1	2	-	-	-	-	-	
<i>chlamydospora</i>	-	-	1	-	-	-	-	-	
<i>cinnamomi</i>	1	2	12	-	-	-	-	-	
<i>phytophthora</i>	-	2	1	-	-	-	-	-	
<i>pyptogea</i>	-	-	2	-	-	-	-	-	
<i>europaea</i>	-	-	1	-	-	-	-	-	
<i>fini</i>	2	2	1	1	-	-	-	1	
<i>lurivora</i>	-	-	8	-	-	-	-	-	
<i>sansomeana</i>	1	-	11	-	2	-	-	-	
<i>p. kelmania</i>	4	11	95	1	5	2	-	9	
<i>colocasiae</i>	-	-	1	-	-	-	-	-	
Total	11	18	162	2	7	2	2	10	

1.2. First report of chrysanthemum root rot caused by *Phytophthora chrysanthemi* in the United States: Sequence-based identification of the historical *Phytophthora* culture collection archived at PDA revealed the presence of *P. chrysanthemi*, a recently described species causing root rot on chrysanthemum in Japan. *Phytophthora* was isolated from chrysanthemum plants exhibiting stunting, wilting, and foliage chlorosis by plating root tissues on PARP medium, after surface disinfection with 70% ethanol. Cultures were preserved in sterilized water containing 2-3 autoclaved hemp seeds. Sequences of the internal transcribed spacer (ITS) region of the four isolates from chrysanthemum were determined. All sequences were 99-100% identical to ITS sequences of *P. chrysanthemi* strains GF749 and Chr3 (AB437135 and AB437136, respectively). Sequences of additional loci of one isolate at the USDA-APHIS CPHST Beltsville Laboratory

showed 100 % match with the sequences of ex-holotype isolate of *P. chrysanthemi*. Morphological characteristics of the isolates were also consistent with those of *P. chrysanthemi* only with slight variation. All isolates were homothallic and produced abundantly smooth-walled, spherical oogonia (average 34.9 µm in diameter). Antheridia were mostly paragynous, and occasionally amphigynous antheridia were observed. Oospores were thick-walled (average 4.4 µm) and mainly plerotic. These isolates produced non-caducous, non-papillate, ovoid and ellipsoid sporangium (average 43.2 µm x 26.4 µm) proliferated internal or external. Abundant hyphal swellings (average 26.8 µm in diameter) and thin-walled chlamydospores were formed on V8 agar. Colonies on V8 agar displayed felt-like, radiate and submerged mycelial growth at the optimum temperature 28-30 °C. The maximum growth temperature was 35 °C. Pathogenicity on chrysanthemum plants also was evaluated. After inoculation, plants were incubated in a chamber, programmed to maintain 34/20 °C day/night with 12-h photoperiod, for four weeks. Infected plants exhibited stunting, wilting, and foliage chlorosis, while the control plants remained healthy. This is the first report of chrysanthemum root rot caused by *P. chrysanthemi* in the U.S.

2. Improvement of diagnostic resources for *Phytophthora*

The *Phytophthora* Database (www.Phytophthoradb.org) supports accurate and rapid identification of *Phytophthora* by providing a comprehensive collection of curated sequence data derived from known species as well as known molecular diagnostic protocols. Its reference sequence database currently houses sequence data from 1-12 loci for 2,623 isolates (representing 123 formally described species and 23 provisionally described species). This database has been utilized many users around the world (~1,500 uses per month on average). Sequences from 15 more species have been generated by our collaborator Dr. Frank Martin at USDA-ARS and will be archived to the database. The diagnostics section of the database is being updated with information covering recently developed diagnostic tools. Another issue we had to address was enhancing the security of *Phytophthora* Database. There have been a number of suspected attempts to breach the server hosting the database. Because the server is connected to the university network, it is essential for us to identify potentially vulnerable points of cyber-attack and fix them. Scanning of all the codes of the database were performed to this end. Some improvements were introduced to the database. We plan to update old codes and security systems to further enhance the security.

Beneficiaries: Even though it would be difficult to quantify the exact amount of savings, this project likely has benefitted many in specialty crop industries and individual growers by helping them respond to emerging disease problems early. The project's primary beneficiaries include Pennsylvania's vegetable, ornamental, and nursery industries and individual growers. Because certain *Phytophthora* species can infect forest tree species, forest product-related industries also are beneficiaries. Results from analyzing *Phytophthora* isolates from streams will help the national *P. ramorum* survey. For many people on the frontlines of defense, such as field pathologists, extension educators, and diagnosticians, have core jobs to fulfill and lack the time and resources necessary to immerse themselves in rapidly evolving molecular data and technologies -- helping them conduct their work using a well curated set of the latest information and tool resources for disease problem solving is essential. The enhanced PD will support these frontline

	defenders by helping recognize and control emerging <i>Phytophthora</i> diseases early and effectively. In 2016, the PD has been utilized ~1,500 times per month on average.
Lessons Learned:	The dynamic nature of pathogen movement underscores the importance of understanding the nature and spatial and temporal distribution of pathogens that affect various specialty crops in Pennsylvania and surrounding states. Sequenced based characterization of historical pathogen culture collections archived at PDA has provided new insights into which pathogens have caused disease and how they have changed over time, which will help predict and prepare against anticipated future problems. We will continuously analyze the data resulted from this year's project. Resulting data and insights will be shared with other via publication and <i>Phytophthora</i> Database.
Additional Information:	<ol style="list-style-type: none"> 1. Kang, S., Mansfield, M., Park, B., and Martin, F. (2016) Molecular identification of <i>Phytophthora</i> isolates using a DNA sequence based approach and the <i>Phytophthora</i> Database. In: K. Ivors (ed.) <i>Laboratory Protocols for Phytophthora Species</i>. APS Press, St. Paul, MN (<i>This chapter in an online book guides how to use sequence data to identify Phytophthora pathogens</i>) 2. Kang, S. (April 20, 2016) Informatics tools that support the preservation and utilization of pathogen culture collections and associated data: Lessons learned from characterizing <i>Fusarium</i> and <i>Phytophthora</i>. Seminar at the Rural Development Agency of Korea (<i>Significance and main utility of Phytophthora and Fusarium Databases for crop security was discussed using part of the data derived from this project as examples</i>). 3. Kang, S. (April 21, 2016) Plant Pathology 2.0. Plenary lecture in the 2016 Korean Society of Plant Pathologist meeting (<i>Importance of preserving and sharing accumulated data via online informatics platforms and tools was presented. The data derived from this project was used as an example to demonstrate how such a cyber-infrastructure can help improve our preparedness against plant diseases</i>).
Project 16	Enhancing Sustainable Practices in the Mushroom Industry
Applicant:	American Mushroom Institute Patricia Foss-Bennie 1284 Gap Newport Pike, Avondale, PA 19311 (610) 268-7483 pfossbennie@americanmushroom.org
Project Summary:	<p>This project addressed a major challenge in the Pennsylvania mushroom farm community to sustain meaningful learning opportunities. It provided additional tools to educate and train mushroom farm employees on best practices including food and worker safety programs considering new Food Safety Modernization Act regulations, OSHA initiatives and the ever-changing workforce.</p> <p>This project is important to ensure a safe workforce and work environment and provide a safe and wholesome product for mushroom consumers. Previous on-site training programs have been successful, but the creation of a bilingual Internet-based study tool</p>

	<p>will further enhance the training process.</p> <p>Initial objectives included:</p> <ol style="list-style-type: none"> 1. Updating and refreshing the food safety training materials for composters, harvesters, contractors and packinghouse employees to incorporate new FSMA requirements. 2. Developing new programs of best practices in food safety in growing operations and packinghouses which enhance current programs. 3. Developing new materials and increasing outreach of educational programs for farmworker safety. 4. Investigating new methods of providing bilingual training to those who need it through webinars, interactive Internet-based and other options. <p>Bilingual training and materials will lead to a better-educated workforce and ultimately a safer product, particularly because the workforce in the mushroom community is both diverse and fluctuating.</p>
<p>Project Approach:</p>	<p>The AMI staff coordinated meetings of the AMI Food Safety Task Force, industry experts and consultants to determine areas where training programs and accompanying materials in food safety and worker safety were needed. Regulations were also reviewed such as FSMA and agricultural Worker Protection Standard to fine-tune training needs. The Committee identified the need to develop a commodity-specific food safety training program as an e-learning tool aimed at employees at the farm and packinghouse. AMI partnered with a consultant to develop nine food safety training lessons, including three topics which apply to both the farm and the packinghouse, covering the basic content as presented in the Mushroom Industry Food Safety Training Kit. The length of each module range between six to 10 minutes and each module includes activities and quiz to demonstrate the employee’s knowledge of key topics. The interactive apps are available in English and Spanish with photos, audio and video footage.</p> <p>Modules included are:</p> <ol style="list-style-type: none"> 1. ABC’s of Food Safety 2. Food Defense 3. Mushroom Contaminants 4. Personal Hygiene (Farm or Packinghouse) 5. Handwashing (Farm or Packinghouse) 6. Cross-Contamination (Farm or Packinghouse) <p>The training apps can be installed on devices such as tablets or phones (Apple iOS and Google Android) for use offline and a web-based platform for use online on a computer.</p>

	AMI staff monitored the progress of development, proofed scripts, reviewed draft versions of each app and participated in beta testing with selected mushroom farm employees.																																																															
Goals and Outcomes Achieved:	<p>The goal and outcomes achieved include increasing mushroom safety by increasing farmworker, supervisor and mushroom producer knowledge of updated best practices programs in the areas of food and farm worker safety. The targeted benchmark was to increase farms’ knowledge of food and farm worker safety by 50 percent. This goal was exceeded based on the number of apps that were downloaded and by the interested measured from the email campaigns.</p> <p>Volunteers from two farms completed the Initial trail testing using both the English and Spanish versions. Employees enjoyed the exercise and thought the apps were easy to use. Several comments indicated that the individualized experience was preferred to group training sessions because employees can compete against themselves and receive immediate feedback from the tests at the end of each session.</p> <p>The training apps were finalized in September 2016 and were uploaded to the Apple Store and Google Play. The following table represents the number of downloads per operating system as of June 27, 2017.</p> <table><tr><td></td><td>iOS</td><td>Android</td></tr><tr><td>The ABCs of Food Safety (Spanish)</td><td>154</td><td>12</td></tr><tr><td>The ABCs of Food Safety (English)</td><td>214</td><td>41</td></tr><tr><td>Personal Hygiene on a Mushroom Farm (Spanish)</td><td>148</td><td>16</td></tr><tr><td>Personal Hygiene on a Mushroom Farm (English)</td><td>161</td><td>26</td></tr><tr><td>Personal Hygiene in a Mushroom Packinghouse (Spanish)</td><td>148</td><td>8</td></tr><tr><td>Personal Hygiene in a Mushroom Packinghouse (English)</td><td>150</td><td>38</td></tr><tr><td>Mushroom Industry Safety Training Program (Spanish)</td><td>163</td><td>11</td></tr><tr><td>Mushroom Industry Safety Training Program (English)</td><td>200</td><td>17</td></tr><tr><td>Mushroom Contaminants (Spanish)</td><td>145</td><td>10</td></tr><tr><td>Mushroom Contaminants (English)</td><td>138</td><td>22</td></tr><tr><td>Handwashing on a Mushroom Farm (Spanish)</td><td>132</td><td>10</td></tr><tr><td>Handwashing on a Mushroom Farm (English)</td><td>145</td><td>21</td></tr><tr><td>Handwashing in a Mushroom Packinghouse (Spanish)</td><td>145</td><td>7</td></tr><tr><td>Handwashing in a Mushroom Packinghouse (English)</td><td>151</td><td>8</td></tr><tr><td>Food Defense (Spanish)</td><td>133</td><td>6</td></tr><tr><td>Food Defense (English)</td><td>144</td><td>16</td></tr><tr><td>Cross-contamination on the Farm (Spanish)</td><td>115</td><td>8</td></tr><tr><td>Cross-contamination on the Farm (English)</td><td>124</td><td>21</td></tr><tr><td>Cross-contamination in the Packinghouse (Spanish)</td><td>90</td><td></td></tr><tr><td>Cross-contamination in the Packinghouse (English)</td><td>100</td><td>13</td></tr></table>		iOS	Android	The ABCs of Food Safety (Spanish)	154	12	The ABCs of Food Safety (English)	214	41	Personal Hygiene on a Mushroom Farm (Spanish)	148	16	Personal Hygiene on a Mushroom Farm (English)	161	26	Personal Hygiene in a Mushroom Packinghouse (Spanish)	148	8	Personal Hygiene in a Mushroom Packinghouse (English)	150	38	Mushroom Industry Safety Training Program (Spanish)	163	11	Mushroom Industry Safety Training Program (English)	200	17	Mushroom Contaminants (Spanish)	145	10	Mushroom Contaminants (English)	138	22	Handwashing on a Mushroom Farm (Spanish)	132	10	Handwashing on a Mushroom Farm (English)	145	21	Handwashing in a Mushroom Packinghouse (Spanish)	145	7	Handwashing in a Mushroom Packinghouse (English)	151	8	Food Defense (Spanish)	133	6	Food Defense (English)	144	16	Cross-contamination on the Farm (Spanish)	115	8	Cross-contamination on the Farm (English)	124	21	Cross-contamination in the Packinghouse (Spanish)	90		Cross-contamination in the Packinghouse (English)	100	13
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	<ul style="list-style-type: none"> • Several articles were published in <i>Mushroom News</i> to keep members up-to-date on the progress and release of the apps. Mushroom News is mailed to over 800 members and subscribers worldwide. <ul style="list-style-type: none"> ○ AMI Update, Food Safety Training Program App (June 2016) ○ Ready, Set, Grow!, Testing for Food Safety Training Apps (August 2016) ○ AMI Update, Food Safety & Worker Safety Training Apps Now Available (October 2016) • Brochures were designed and printed to hand out at committee meetings and presentations. • Promotional ads were published in the five issues of <i>Mushroom News</i>. • Two marketing emails were sent to 304 AMI members with information about the new app and instructions on how to download. The first email was opened by 50 percent of the targeted audience with 18.4 percent clicking the URL to get more information. The second email was read by 51% of the targeted audience with 25.7% opening the embedded URL. • Presentations were made to more than 150 attendees at the Penn State Mushroom Short Course and the Spanish Mushroom Short Course in October 2016. • Articles were published in other industry trade publications. • The AMI website (www.americanmushroom.org) was updated to include information on the training apps and links to the web-based version.
Beneficiaries:	<p>The main beneficiaries of this project are the 65 mushroom farm operations in Pennsylvania. Also, the composters, harvesters, contractors, packing and shipping operations, compost operations and service and equipment suppliers benefited by a strengthened production sector.</p> <p>Alternately, other mushroom farms throughout the U.S. were able to download and use the same apps to enhance their training programs.</p>
Lessons Learned:	<p>The training apps were well received by grower members. With thousands of employees and the significant cost to train everyone, these training apps were provided free of charge to help replace or enhance existing training programs.</p> <p>From grower feedback, we realized that different platforms should have been provided for growers who do not have the technology available to use computer apps. CDs and videos should have been offered at the same time to meet the needs of the everyone.</p>
Additional	Food Safety Training apps are available on the AMI website at

Information:	http://americanmushroom.org/training-tools/ Worker Safety Training Apps are available on the AMI website at http://americanmushroom.org/safety-training/																								
Appendix- 1	Appendix- 1 for RFP																								
	<p style="text-align: center;">2015 Program Timeline</p> <p>PHASE I Request for Concept Papers: Applicants will submit a short concept paper following the requirements outlined in the Request for Concept Papers. Concept papers will be reviewed by the Specialty Crop Advisory Board and PDA.</p> <p>PHASE II Request for Grant Proposals: Successful applicants will be asked to submit a full proposal based on the concept paper submitted in PHASE I.</p> <p>PHASE III Announce Awards: Successful applicants will be notified of awards and required to sign and submit contracts.</p> <p>PHASE IV Submit Reports: Applicants are required to submit annual reports 30 days after the end of the first year of the date of the signed grant agreement and each subsequent year until the expiration date of the grant period. Final reports are required 30 days following the end date of the grant or upon completion of the project.</p> <p style="text-align: center;">Timeline - 2015 - Specialty Crop Block Grant Program</p> <table><tr><td rowspan="2">Phase I</td><td>January 30, 2015</td><td>Release Notice of Funding Availability - Request for Concept Proposals</td></tr><tr><td>February 27, 2015, 4:00PM</td><td>Concept Proposals Due</td></tr><tr><td rowspan="3">Phase II</td><td>March 9, 2013</td><td>Send Invitations to Request Full Grant Proposals</td></tr><tr><td>April 17, 2015, 4:00PM</td><td>Full Grant Proposals Due</td></tr><tr><td>July 8, 2015</td><td>Grant Proposals to USDA for Approval</td></tr><tr><td rowspan="2">Phase III</td><td>October/November 2015</td><td>Announce and Award Grant Agreements</td></tr><tr><td>October/November 2015</td><td>Contracts Due</td></tr><tr><td rowspan="3">Phase IV</td><td>April 30</td><td>Semi-Annual Reports Due</td></tr><tr><td>October 30,</td><td>Annual Reports Due</td></tr><tr><td>October 30</td><td>Final Reports Due</td></tr></table> <p><i>Late applications will not be considered. Please keep in mind there is an occasional delay with email; therefore, it is recommended you allow ample time for the email to successfully be received by PDA. For additional information, please contact: Samantha Snyder, at (717) 787-3568 or msheffield@pa.gov.</i></p> <p>Mission:</p>	Phase I	January 30, 2015	Release Notice of Funding Availability - Request for Concept Proposals	February 27, 2015, 4:00PM	Concept Proposals Due	Phase II	March 9, 2013	Send Invitations to Request Full Grant Proposals	April 17, 2015, 4:00PM	Full Grant Proposals Due	July 8, 2015	Grant Proposals to USDA for Approval	Phase III	October/November 2015	Announce and Award Grant Agreements	October/November 2015	Contracts Due	Phase IV	April 30	Semi-Annual Reports Due	October 30,	Annual Reports Due	October 30	Final Reports Due
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PDA’s SCBGP mission is to enhance the competitiveness of Pennsylvania State’s specialty crops. PDA intends to fund projects that will result in the greatest positive economic impact for specialty crop industry to enhance the competitiveness of our specialty crops and increase the sustainability of Pennsylvania’s agricultural industry.

Eligible Crops:

Fruits, vegetables, tree nuts, dried fruits, and nursery crops (including floriculture). See the external link for complete listing here.

Eligible Applicants:

Eligible Pennsylvania non-profit organizations, local, government entities, for-profit organizations, industry trade associations, and producer groups. Grant funds will not be awarded for projects that solely benefit a particular commercial product or provide a profit to a single organization, institution, or individual. Single organizations, institutions, and individuals are encouraged to participate as project partners. The following are some examples of acceptable and unacceptable projects:

Example of Unacceptable Projects:

A company requests grant funds to purchase starter plants or equipment used to plant, cultivate, and grow a specialty crop for the purpose of making a profit, or to expand production of a single business.

Example of Acceptable Projects:

A single grower requests funds to demonstrate the viability of organic small fruit production and partners with Cooperative Extension to publicize the working model of diversification to other regional growers.

A single company requests funds to provide a viable pollination alternative to specialty crop stakeholders in the region, which currently does not have one.

Funding Priorities:

PDA has identified the following nine areas as the 2015 Specialty Crop Funding Priorities. Projects that address any of these five priorities will receive a scoring preference.

2015 Program Area Priorities:

1. Enhancing food safety
2. Assisting all entities in the specialty crop distribution chain in developing “Good Agricultural Practices,” “Good Handling Practices,” “Good Manufacturing Practices,” and in cost-share arrangements for funding audits of such systems for small farmers; packers and processors
3. Investing in specialty crop research, including research to focus on conservation

and environmental outcomes

4. Developing new and improved seed varieties and specialty crops
5. Pest and disease control; and development of organic and sustainable production practices
6. Increasing child and adult nutrition knowledge and consumption of specialty crops
7. Improving efficiency and reducing costs of distribution systems
8. Developing local and regional food systems
9. Improving food access in underserved communities

Applicants may submit multiple Concept Papers, but each proposal must be submitted separately. Following ranking by the industry advisory board, applicants will be notified of an invited to submit a full project proposal.

Full Proposal Overview

Project proposals may be submitted for a minimum of \$20,000 and for a project timeline of up to 2 years. Applicants are highly encouraged to provide evidence of matching funds, either in-kind or cash.

Project Full - Proposal Format:

The style of presentation and length may vary, depending on the nature of project(s). All proposals must contain for the following sections listed below. Proposals must be no more than 6 pages, including attachments (letters of support may be additional). The acceptable font size for all narrative is 12 pitch and all margins must be 1 inch.

Cover Page - Name of Organization, Name of primary contact, mailing address, and contact information.

Project Title and Abstract – Project title should accurately describe proposed project.

Abstract - Include a project abstract of 200 words or less. The project abstract must contain a summary of the proposed project suitable for dissemination to the public. It should be a self-contained description of the project and should contain a statement of objectives and methods to be employed.

Project Purpose – The following questions should be addressed in this section: What is the specific issue, problem or need to be addressed by the project? Why is the project important and timely? What are the objectives of the project? If the project builds on a previously approved project, how does this project compliment work done previously?

Provide a summary (3 to 5 sentences per project) of the results of the completed work on this project, the long-term quantifiable effects of these results (especially as they impact on the specialty crop industry), and how this year's funding will supplement or build on previous funding from the SCBGP or SCBGP-FB.

Potential Impact - This section should show how the project potentially impacts the specialty crop industry and/or the public rather than a single organization, institution, or individual. The following questions should be answered: Who are the beneficiaries of the project? How many beneficiaries will be impacted? How will the beneficiaries be impacted by the project? What is the potential economic impact of the project if available?

Expected Measurable Outcomes – The following questions should be answered in this section. What is at least one distinct, quantifiable, and measurable outcome that directly and meaningfully supports the project's purpose and is of direct importance to the intended beneficiaries? The measurable outcome, when possible, should include the following: performance toward meeting the outcome(s) be monitored? Define who your data sources are, and how will data be collected.

Work Plan – The following information should be included in this section. Identify the activities necessary to accomplish the project objectives. Indicate who will do the work of each activity. If collaborative arrangements or subcontracts are used, make sure you specify their role and responsibilities in performing project activities. Include timelines for accomplishing each activity. Make sure to include the month and year the project is scheduled to begin.

Budget Narrative -

Although there is no specific format for the supplemental budget, the budget should contain a narrative in paragraph format for the project. Budget should be reasonable and justifiable for requested funds. The required cost categories are as follows:

PERSONNEL - Persons employed by the grantee or sub-grantee organization should be listed in this category. Those employed elsewhere would be listed as subcontractors or consultants in the "Other" category. For each project participant, indicate their title, percent of full time equivalents (FTE), and corresponding salary for the FTE.

FRINGE BENEFITS - Provide the rate of fringe benefits for each project participant's salary described in the personnel section

TRAVEL - Please provide the following information in the narrative if applicable: destination; purpose of trip; number of people traveling; number of days traveling; estimated airfare costs; estimated ground transportation costs; estimated lodging and meals costs; estimated mileage costs for the travel.

EQUIPMENT – This category includes items of property having a useful life of more than one year and an acquisition cost of \$5,000. If the cost is under \$5,000, then include these items

under SUPPLIES.
Provide an itemized list of equipment purchases or rentals, along with a brief narrative on the intended use of each equipment item, and the cost for all the equipment purchases or rentals.

SUPPLIES – This is anything with acquisition cost under \$5,000 and could be anything from office supplies and software to educational or field supplies.

CONTRACTUAL – Provide a short description of the services each contract covers and include the flat rate fee OR the total hourly rate fee for each contract. When possible break out the specific costs associated with the contract.

OTHER – Provide a detailed description of all other direct costs such as:
a) Conferences - Communications –Speaker/Trainer Fees- Data collection

MATCHING FUNDS - Whether in cash or in-kind contribution to the project.

INDIRECT COSTS - Indirect cost should not exceed 10 percent. Provide a justification if indirect costs exceed 8 percent.

Project Oversight - Describe the oversight practices that provide sufficient knowledge of grant activities to ensure proper and efficient administration.

Project Commitment - Describe how all grant partners commit to and work toward the goals and outcome measures of the proposed project.

Multi-state Projects - Describe how the States are going to collaborate effectively with related projects. Each State participating in the project should submit the project in their State plan indicating which State is taking the coordinating role and the percent of the budget covered by each State.

Deadline - Full proposals must be submitted both electronically and ten (10) paper copies should be post marked by April 17, 2015 (4 p.m.). Please do not place paper applications in any kind of notebook, binder, folder, etc. Use a paper clip or binder clip. Send applications to Pennsylvania Department of Agriculture, 2301 North Cameron Street, Harrisburg, PA 17110
ATT: Morgan Sheffield